GEORGIA 1975

Employment Outlook by Industry Group

by Amy Collins
INDUSTRIAL DEVELOPMENT DIVISION

Project E-400-410

1969

Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia

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Foreword

This report, one of a series of studies of the economy of Georgia by Mrs. Amy Collins, Research Economist on the staff of the Industrial Development Division, forecasts the manpower requirements of various industrial sectors in Georgia by 1975. It should be of interest to all who are concerned with the direction that various industries in the state are taking and the potential impact of these industries on the economy. The impetus for this study was generated by the Division's involvement in providing technical services to industry and the recognition of the contribution that such a study could make to the overall planning of the Georgia State Technical Services program.

Forecasting is difficult, especially where a high degree of accuracy is desired. By reducing the time span of the forecast period somewhat it is possible to arrive at short-term forecasts which have considerable validity. Mrs. Collins has achieved this with an eight-year forecast period, based on the year 1967.

Much of this report is made up of individual industry analyses and forecasts of employment. Especially significant in these write-ups are the descriptions of the latest techniques and innovations coming into increasing use in the industrial categories reviewed. As the author points out, these will have a great impact on the future employment in these industries, not only in terms of quantities of people employed, but also in the types of training and experience which will be increasingly needed.

Any comments or suggestions the reader may have after reading this report will be welcomed.

Ross W. Hammond, Chief
Industrial Development Division
GEORGIA INSTITUTE OF TECHNOLOGY

INTRODUCTION

This study presents projections of Georgia employment for the year 1975 by major industry groups. Two figures are given for each industry discussed, reflecting two approaches to the varying development possibilities in the state. One projection assumes the continuation of a least squares trend line based on employment data for the 1947-1967 period. The other shows Georgia's manpower based on its growth pattern in the industry relative to the U. S.

Unless otherwise indicated, all employment figures are wage and salary workers in nonagricultural industries, as published by the Bureau of Labor Statistics. Projections of U. S. employment in 1975 are taken from "America's Industrial and Occupational Manpower Requirements 1964-75," U. S. Department of Labor, Bureau of Labor Statistics, January 1, 1966, with some modifications as published in "Manpower Report of the President - April 1968," also by the U. S. Department of Labor.

As background to these projections the study examines some of the technological changes that are influencing the future development of industry in this country, with particular reference to manpower requirements.

The employment projections for Georgia are summarized in Part I. Trends in the different industries are discussed, together with the effect of the changes on the occupational structure of the labor force. Projections of employment for all major manufacturing industries in Georgia are given in Part II, and some of the technological advances influencing each industry are reviewed. Similar projections and comment on the major groups of nonmanufacturing employment are given in Part III. A brief review of Georgia's growth as measured by income is added as an appendix.

Part I

SUMMARY, ANALYSIS, AND IMPLICATIONS

SUMMARY, ANALYSIS, AND IMPLICATIONS

The employment projections by industry for Georgia which are illustrated and discussed in the body of the report are summarized in Table 1 and Chart 1 overleaf. Projection "L" represents a linear trend based on data for the years 1947 through 1967; projection "P" is based on the trend of Georgia's share of U. S. employment. In view of the many unknown possibilities, as well as the known variables in the economic future of the state, these projections are offered as possible developments rather than specific predictions. They do, however, lend some dimension to future plans for industrial manpower requirements.

The Bureau of the Census has projected a total population of 5,147,000 in Georgia by 1975[1/] (2.31% of the projected U. S. population). An increasing proportion of this population will be nonagricultural wage and salary workers. In 1967 some 30.71% of the state's population came under this definition, compared with 33.39% for the U. S. By 1975 the national figure is expected to be some 34.13%. Projections "L" and "P" on the table overleaf give 29.35% and 32.95%, respectively, for Georgia. Since the state is expected to draw closer to the national pattern, it would therefore appear that projection "P" gives the more reasonable assumption of Georgia's manpower pattern in 1975.

Table 2 shows the 1967-1975 employment changes as indicated by the two series of projections. Except for transportation equipment and food manufacturing, the "P" projections give more generous estimates of future industrial development than those based on the trends of the past 20 years. Both projections, however, show manufacturing employment increasing at a lesser rate than all other major industrial categories with the exception of transportation and public utilities.

This is partly due to the larger base on which the manufacturing increase is calculated, but this does not apply to the overall total of nonagricultural employment, which in both series shows a percentage gain considerably above the comparable figure for manufacturing. In addition, two industries -- government and trade -- surpass manufacturing in the increase in actual numbers of employees.

1/ Current Population Reports, Series P25, No. 375, October 3, 1967, Series IIB.

Table 1

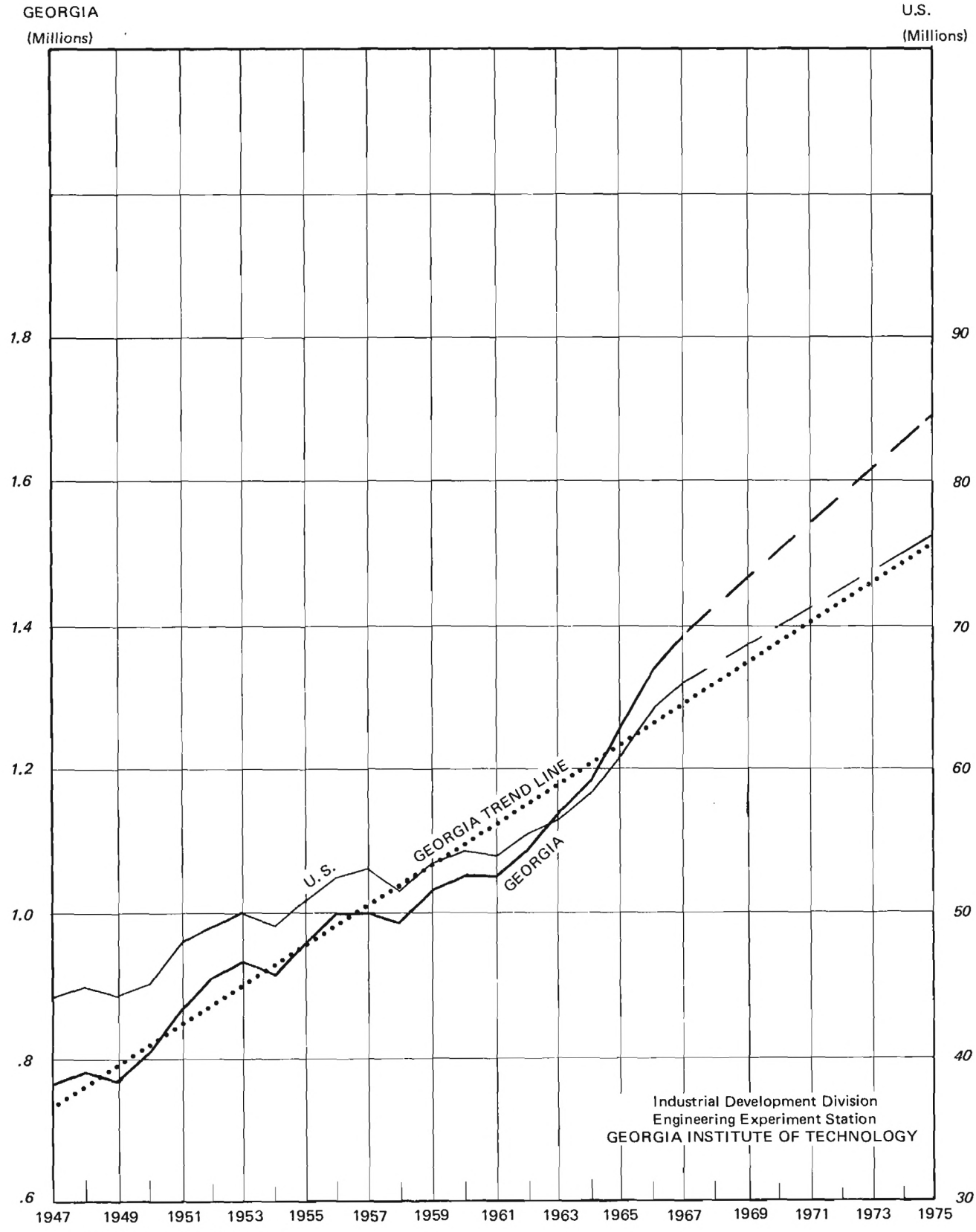
PROJECTIONS OF NONAGRICULTURAL WAGE AND SALARY WORKERS IN GEORGIA, BY MAJOR INDUSTRIES, 1975

Industry	Employment (000) 1967	1975L	1975P
Manufacturing			
Durable goods:			
Lumber & wood products	26.2	12.7	19.7
Furniture & fixtures	9.4	10.1	11.1
Stone, clay, & glass products	14.2	17.1	17.9
Primary metal industries	7.1	7.2	7.5
Fabricated metal products	14.5	16.5	18.5
Machinery	13.4	13.4	14.8
Electrical equipment & supplies	8.7	10.9	12.4
Transportation equipment	44.8	56.9	55.7
Other durables (ordnance, instruments, & miscellaneous manufacturing)	10.5	10.2	10.6
Nondurable goods:			
Food & kindred products	49.0	56.9	53.9
Textile mill products	112.1	99.2	116.0
Apparel & related products	67.5	80.3	90.1
Paper & allied products	23.6	29.6	33.1
Printing, publishing, & allied industries	13.4	14.8	14.9
Chemicals & allied products	12.5	13.5	13.8
Leather & leather products	4.6	5.7	5.8
Other nondurables (tobacco, petroleum refining, rubber & miscellaneous plastics products)	5.7	6.3	6.9
Total manufacturing	437.2	461.3	502.7
Mining	6.5	6.9	7.6
Contract construction	74.8	85.7	100.6
Transportation & public utilities	94.9	89.7	103.0
Trade, wholesale & retail	290.0	317.1	359.4
Finance, insurance, & real estate	66.2	81.6	87.9
Services & miscellaneous	156.4	175.7	198.1
Government	258.9	292.4	336.7
Total	1,384.9	1,510.4	1,696.0

L - Linear trend based on data for the 1947-1967 period.

P - Based on trend of Georgia's share of U. S. employment.

CHART 1
NONAGRICULTURAL WAGE AND SALARY WORKERS, GEORGIA AND THE U. S.



Source: See Introduction, page 1.

Table 2

PROJECTED EMPLOYMENT CHANGES IN GEORGIA, 1967-1975

Industry	Changes, 1967-1975 Employment (000) L	P	Percent L	P
Manufacturing				
Durable goods:				
Lumber & wood products	-13.5	- 6.5	-51.5	-24.8
Furniture & fixtures	.7	1.7	7.4	18.1
Stone, clay, & glass products	2.9	3.7	20.4	26.1
Primary metal industries	.1	.4	1.4	5.6
Fabricated metal products	2.0	4.0	13.8	27.6
Machinery	-	1.4	-	10.4
Electrical equipment & supplies	2.2	3.7	25.3	42.5
Transportation equipment	12.1	10.9	27.0	24.3
Other durables (ordnance, instruments, & miscellaneous manufacturing)	- .3	.1	- 2.9	1.0
Nondurable goods:				
Food & kindred products	7.9	4.9	16.1	10.0
Textile mill products	-12.9	3.9	-11.5	3.5
Apparel & related products	-12.8	22.6	19.0	33.5
Paper & allied products	6.0	9.5	25.4	40.3
Printing, publishing, & allied industries	1.4	1.5	10.4	11.2
Chemicals & allied products	1.0	1.3	8.0	10.4
Leather & leather products	1.1	1.2	23.9	26.1
Other nondurables (tobacco, petroleum refining, rubber & miscellaneous plastics products)	.6	1.2	10.5	21.1
Total manufacturing	24.1	65.5	5.5	15.0
Mining	.4	1.1	6.2	16.9
Contract construction	10.9	25.8	14.6	34.5
Transportation & public utilities	- 5.2	8.1	- 5.5	8.5
Trade, wholesale & retail	27.1	69.4	9.3	23.9
Finance, insurance, & real estate	15.4	21.7	23.3	32.8
Services & miscellaneous	19.3	41.7	12.3	26.7
Government	33.5	77.8	12.9	30.1
Total	125.5	311.1	9.1	22.5

This decline in the relative importance of manufacturing workers continues a trend in nonagricultural employment existing not only in Georgia but also in the nation as a whole. A shift has been taking place in the industrial composition of the economy -- not as dramatic as the continuing drop in the number of agricultural workers (which is expected to continue through 1975), but nevertheless of considerable significance in considering future manpower requirements. Table 3 gives the employment distribution in Georgia for selected years, and shows a comparative decline in transportation and public utilities as well as in manufacturing. Government shows major gains in its proportion of employment; and finance, insurance, and real estate, services, and construction also show increasing percentages in the 25-year span.

These general trends follow the national pattern, although the Georgia distributions vary substantially from those of the nation for the same years. By 1975 manufacturing employment for the U. S. is expected to account for some 26% of nonagricultural workers and government for 18.5%, while the Georgia percentages for these categories will be in the neighborhood of 30% and 19.5%, respectively. The greatest variation from the state according to this study's projections, however, will be in services, with a national figure of 17.1% compared with Georgia's 11.6% to 11.7%. It would appear, then, that the state will lag behind the nation in the major expansion of services employment that is already taking place, but will maintain a comparatively high proportion of manufacturing employment.

These are very broad industrial categories, however, covering a wide range of jobs, and the jobs themselves are changing under the impact of technological developments.

The rate of technological change in Georgia and its influence on employment requirements will obviously vary greatly between industries, and between individual firms within each industry. Nevertheless, some general implications can be drawn from the recurrence of similar statements in many of the industry discussions.

The occupational structure of the labor force is undergoing significant changes throughout the U. S. Technological innovations are expanding the need for professional and technical personnel and limiting the jobs available for unskilled workers. This shift is not a sudden development, but part of a long, drawn-out process -- often a matter of painful decision on the part of individual

Table 3

DISTRIBUTION OF EMPLOYMENT IN GEORGIA, SELECTED YEARS, 1950-1975

Industry	Percent Distribution				
	1950	1960	1967	1975L	1975P
Manufacturing					
Durable goods:					
Lumber & wood products	5.6	2.8	1.9	.8	1.2
Furniture & fixtures	.9	.7	.7	.7	.7
Stone, clay, & glass products	.9	1.0	1.0	1.1	1.1
Primary metal industries	.4	.4	.5	.5	.4
Fabricated metal products	.5	.7	1.0	1.1	1.1
Machinery	.7	.8	1.0	.9	.9
Electrical equipment & supplies	.1	.5	.6	.7	.7
Transportation equipment	1.0	2.4	3.2	3.8	3.3
Other durables (ordnance, instruments, & miscellaneous manufacturing)	.4	.5	.8	.7	.6
Nondurable goods:					
Food & kindred products	4.0	4.3	3.5	3.8	3.2
Textile mill products	13.3	9.5	8.1	6.5	6.8
Apparel & related products	3.8	4.5	4.9	5.3	5.3
Paper & allied products	1.4	1.8	1.7	1.9	1.9
Printing, publishing, & allied industries	.9	.9	1.0	1.0	.9
Chemicals & allied products	1.1	1.0	.9	.9	.8
Leather & leather products	.3	.3	.3	.4	.3
Other nondurables (tobacco, petroleum refining, rubber & miscellaneous plastics products)	.2	.3	.4	.4	.4
Total manufacturing	35.5	32.4	31.5	30.5	29.6
Mining	.5	.5	.5	.5	.4
Contract construction	5.0	5.3	5.4	5.7	5.9
Transportation & public utilities	8.4	7.0	6.9	5.9	6.1
Trade, wholesale & retail	21.3	21.4	20.9	21.0	21.2
Finance, insurance, & real estate	3.5	4.7	4.8	5.4	5.2
Services & miscellaneous	10.8	11.0	11.3	11.6	11.7
Government	14.9	17.7	18.7	19.4	19.9
Total	100.0	100.0	100.0	100.0	100.0

proprietors who have to weigh the potential of new inventions as applied to their product against such concerns as the capital required, the labor changes involved, competition, and future market prospects.

One of the basic characteristics of technological progress is increased output per man-hour. This increased output is often in response to, and usually can be absorbed by, increased consumer demand; but on the production lines, the number of workers is reduced and greater emphasis is put on maintenance engineers, programmers, and supervisory personnel. This pattern of technological change appears in varying degrees throughout industry, with many unskilled workers being displaced by laborsaving devices, while new positions open up for highly skilled workers.

At the same time, whole new industries are being created as a result of the new materials and new techniques developed by research workers -- from satellite communications and aerospace activities to the freeze-drying of foods. Although the emphasis in most of these new industries is on technically skilled personnel, a proportion of unskilled or semiskilled jobs also becomes available.

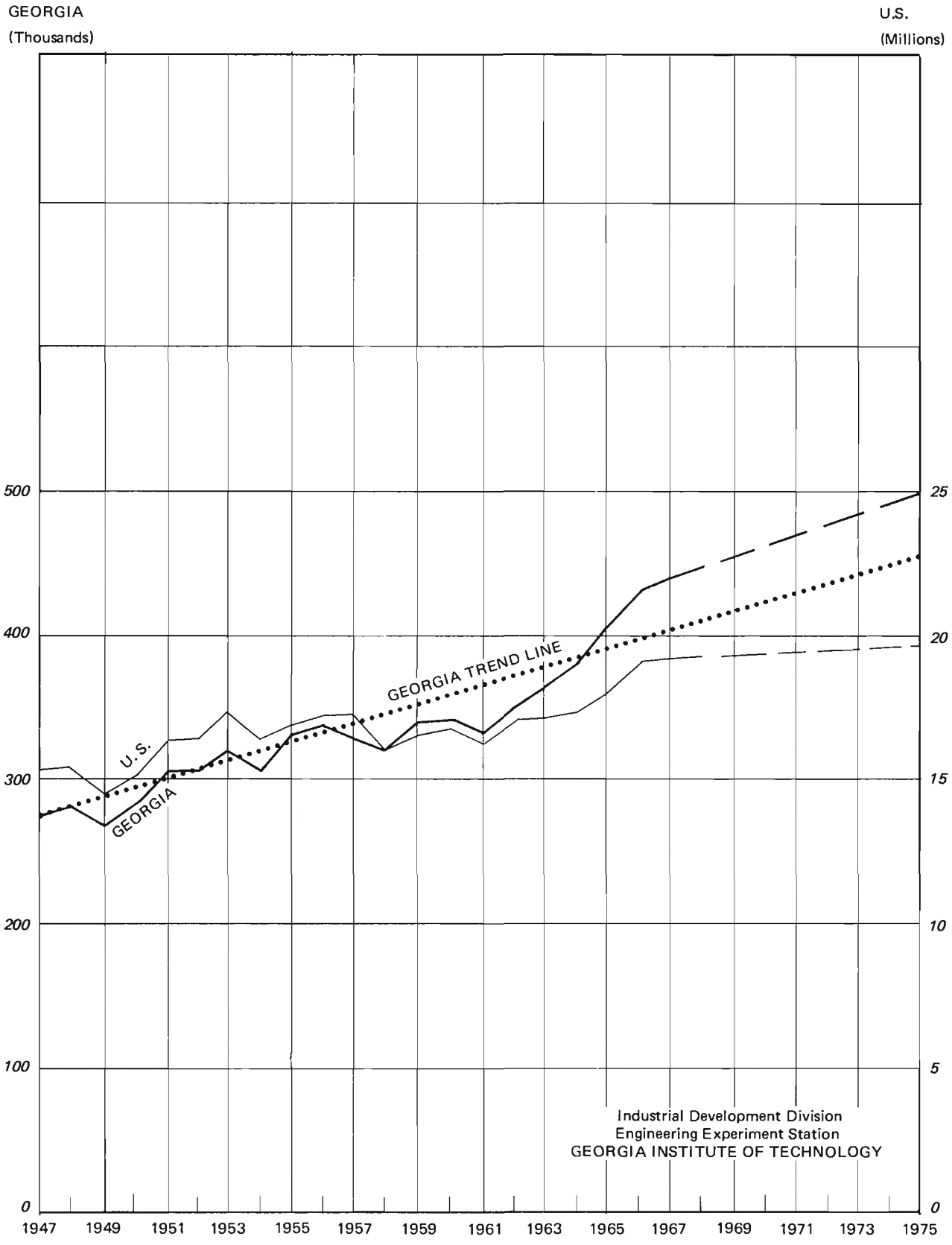
The addition of these new jobs to the basic requirements of an expanding economy means that the employment figures for unskilled and semiskilled workers will remain fairly stable through 1975, although the number of these less-skilled workers will decline as a percentage of total employment.

This means that a higher proportion of the work force -- in Georgia as in the rest of the nation -- must be trained for more demanding jobs. Training and retraining programs will become more and more essential to enable displaced workers to shift to available jobs, and to ensure that new entrants to the labor market will be prepared to meet the changing requirements of industry.

Part II

MANUFACTURING EMPLOYMENT

CHART 2
MANUFACTURING EMPLOYMENT



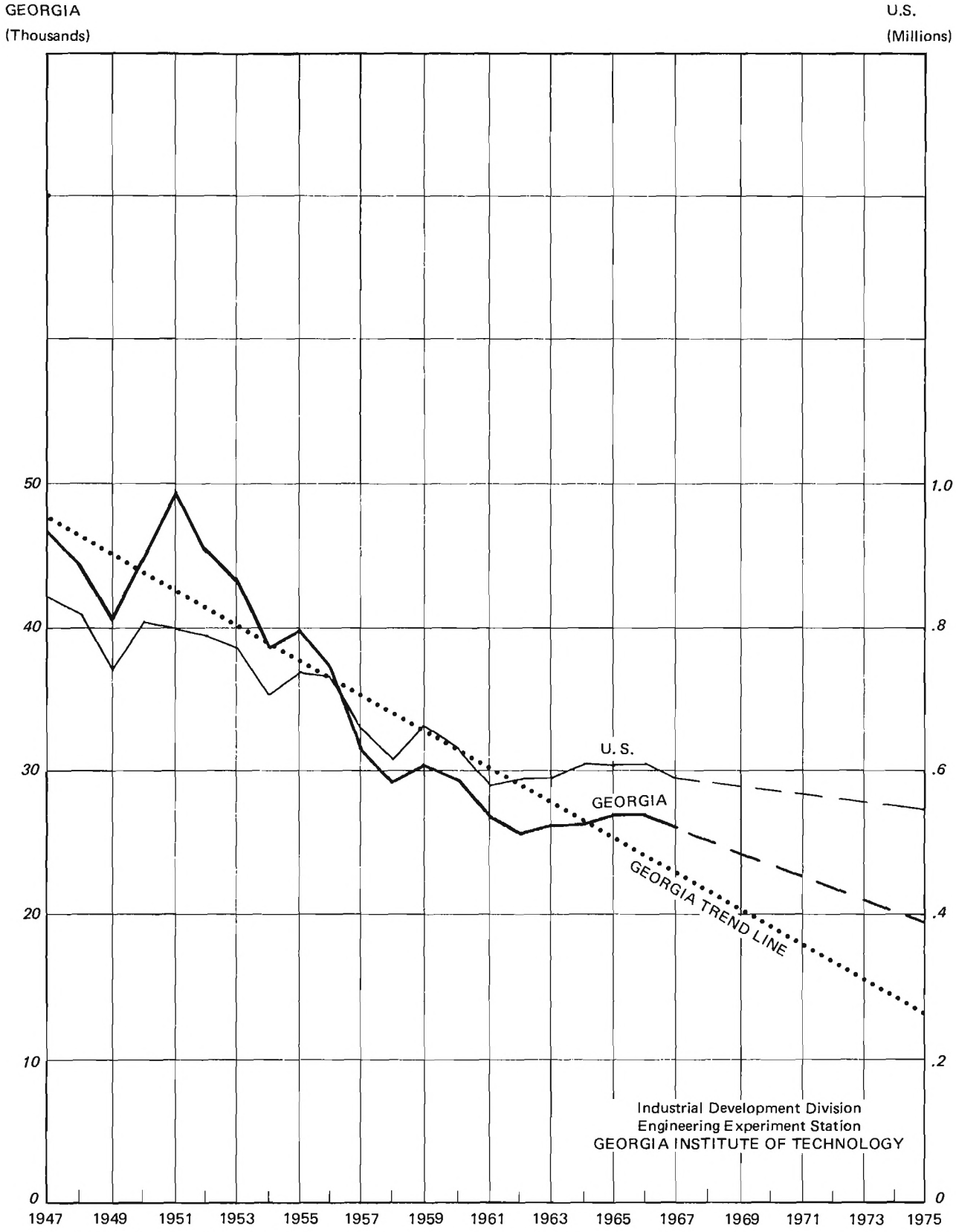
Source: See Introduction, page 1.

MANUFACTURING
(SIC Division D)

In view of the importance of manufacturing employment, this SIC Division is examined in detail for all the two-digit classifications for which the Bureau of Labor Statistics provides data for Georgia. The impact of technological change is expected to vary considerably between industries. In some instances employment growth will be reduced by the increased output per man-hour; in other cases the development of new products and markets will cause a rapid expansion of both production and employment. In general, however, increased automation will lead to stepped up requirements for skilled maintenance workers, technicians, and supervisory personnel, and a reduced need for machine operators and materials handlers.

Georgia's proportion of national employment in manufacturing industries varies from a fraction of a percent up to nearly 12% (for textiles), and although the straight line trend on Chart 2 is based on total manufacturing workers, the other state projection is a summary of the individual industry results (including separate calculations for "other durable" and "other nondurable" employment). Based on the sum of the individual industries, Georgia's employment in manufacturing will reach some 2.55% of the total for the nation by 1975, compared with 2.26% in 1967.

CHART 3
LUMBER AND WOOD PRODUCTS EMPLOYMENT



Source: See Introduction, page 1.

LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE (SIC 24)

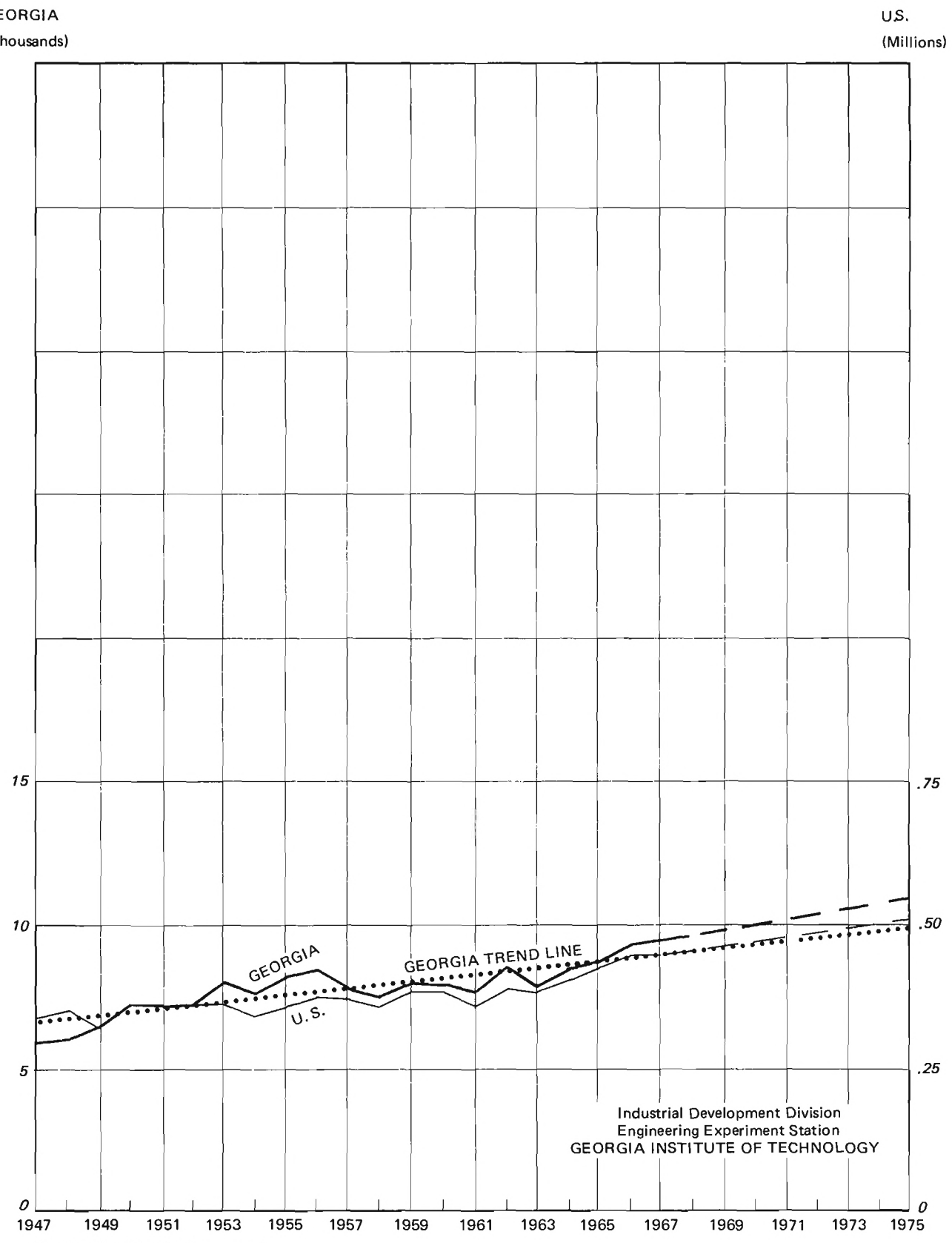
Employment in the lumber and wood industry has fluctuated over the past 20 years, but the overall trend has been downward. Some further decline is anticipated to 1975. Part of the reduction in the work force is due to the increased use of specialized machinery and equipment in sawmills and planing mills that eliminates a great deal of manual labor; in addition, the competition of other materials has affected the market for wood products.

Research into new methods of treating wood has already produced new lumber products to meet this competition. Chemicals are used on the wood to preserve it against insect and water damage and to reduce the danger from fire. Plastic impregnated paper is being used for overlays that will reduce maintenance costs, and experiments with direct wood impregnation are being made.

Employment has increased in the production of plywood and particleboard, and is expected to show further gains in the future. New equipment can now process smaller diameter trees and will pull a greater share of the plywood industry into Georgia to harvest the southern pine. The particleboard industry is also expected to increase, and should lead to some employment gain in Georgia, partially offsetting decreases in other segments of the lumber and wood industry.

If the downward trend of employment in this industry since 1947 in Georgia is extended to 1975, the total number of workers will be 12,700 compared with 26,200 in 1967. When Georgia's proportion of the total industry for the U. S. is considered, however, the modification of the rate of employment decline as projected by the U. S. Department of Labor would bring the state's employment in 1975 to 19,700 workers. This figure would account for 3.6% of the nation's employment in the lumber and wood industry compared with 4.4% in 1967.

CHART 4
FURNITURE AND FIXTURES EMPLOYMENT



Source: See Introduction, page 1.

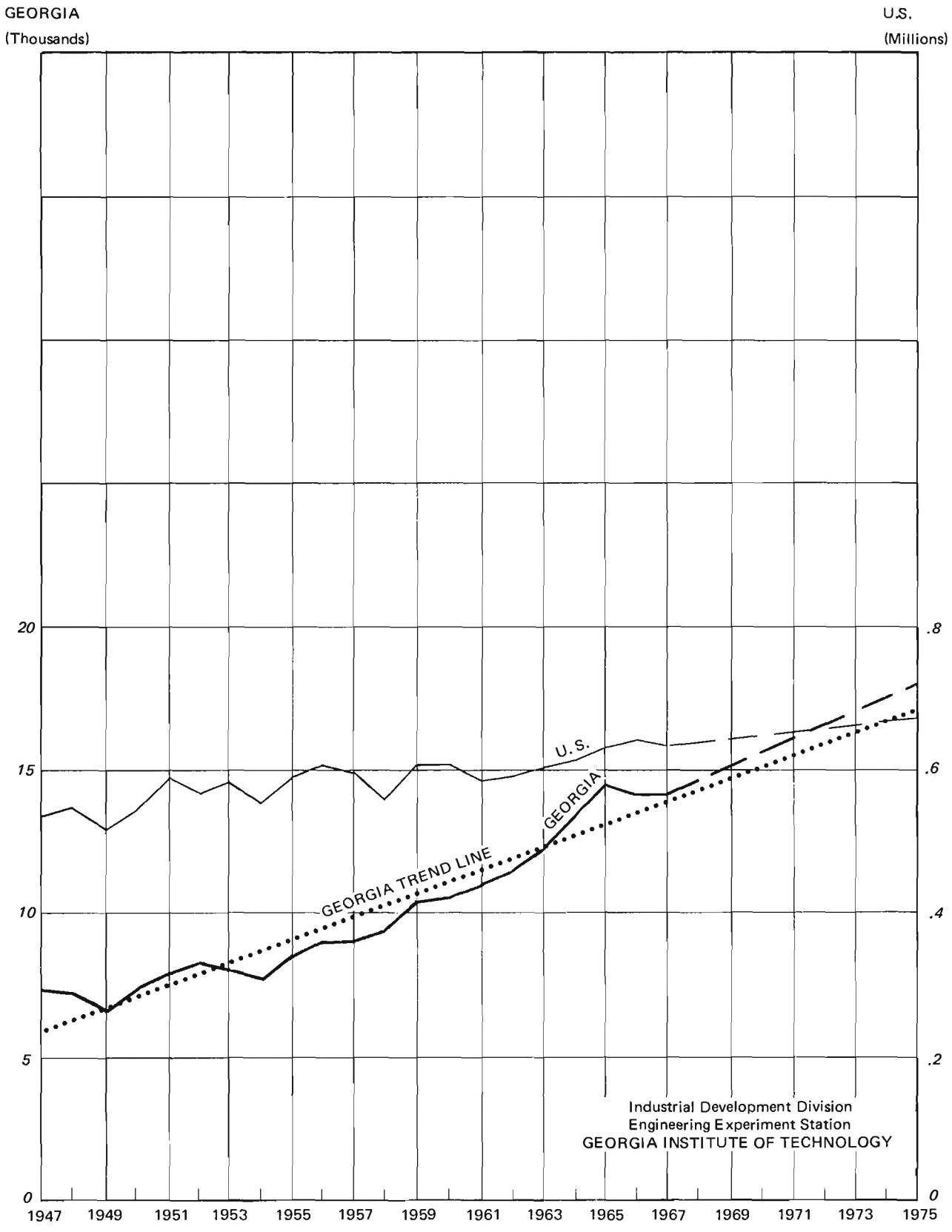
FURNITURE AND FIXTURES
(SIC 25)

The demand in this industry is expected to outstrip the increased output per man-hour resulting from new technological processes, causing a continued gain in employment. Part of the demand is expected to come from the formation of new families as the nation's population increases. The continued growth of real income will stimulate this demand, since expenditure on furniture and fixtures tends to increase with income.

Technological changes that are taking place include improved woodworking and sanding machinery and multi-purpose equipment that increase efficiency and cut production time. Larger plants can be expected, so that companies may take advantage of the mass production made possible by the new techniques. New methods of gluing are likely to become more important. Various forms of plastics will be used even more widely than at present, and the manufacture of lightweight metal furniture is also expected to increase.

Employment in the U. S. increased by 35.8% between 1947 and 1967. In this same period Georgia's employment increased from 5,900 to 9,400 workers, a gain of 59.3%. This 1947-1967 employment trend projected to 1975 would give the state some 10,100 workers at that date. During the past 20 years, however, Georgia's proportion of U. S. employment has grown from 1.76% to 2.06%. If this trend is continued, over 11,100 furniture and fixtures workers will be employed in Georgia by 1975, representing 2.18% of the nation's total in this industry.

CHART 5
STONE, CLAY, AND GLASS PRODUCTS EMPLOYMENT



Source: See Introduction, page 1.

STONE, CLAY, AND GLASS PRODUCTS
(SIC 32)

The national outlook for employment in this industry is mixed, with anticipated demand in some sectors being filled by the same or a lesser work force and in other sectors creating an additional number of jobs. The overall trend, however, is for a modest increase in employment.

Plate glass for the construction and automotive markets is being gradually superseded by float glass, which is made by a continuous process that eliminates polishing and grinding steps -- as well as the labor that performed those steps.

The manufacture of glass containers already is highly automated, and much of the current research is aimed at improving the quality and attractiveness of the product. Plastic, metal, and paper containers have made heavy inroads in former glass markets, and the industry is fighting the competition by producing nonreturnable bottles, lighter-weight containers, and new surface treatments that decrease breakage. Costs have also been reduced by cheaper methods of coloring, improved labeling techniques, and more efficient equipment for packing and handling. These efforts are resulting in a gradually increased output of glass containers, with some gains in both output per man-hour and total employment. This trend is expected to continue.

The demand for hydraulic cement depends primarily on the construction industry, where continued growth is anticipated. Technological advances being put into operation in the large cement plants now being built, however, will enable these plants to produce cement at a much faster rate, with less employment. A shift in type of occupation is expected, with a greater proportion of jobs being held by highly skilled technicians able to control and maintain the complex equipment.

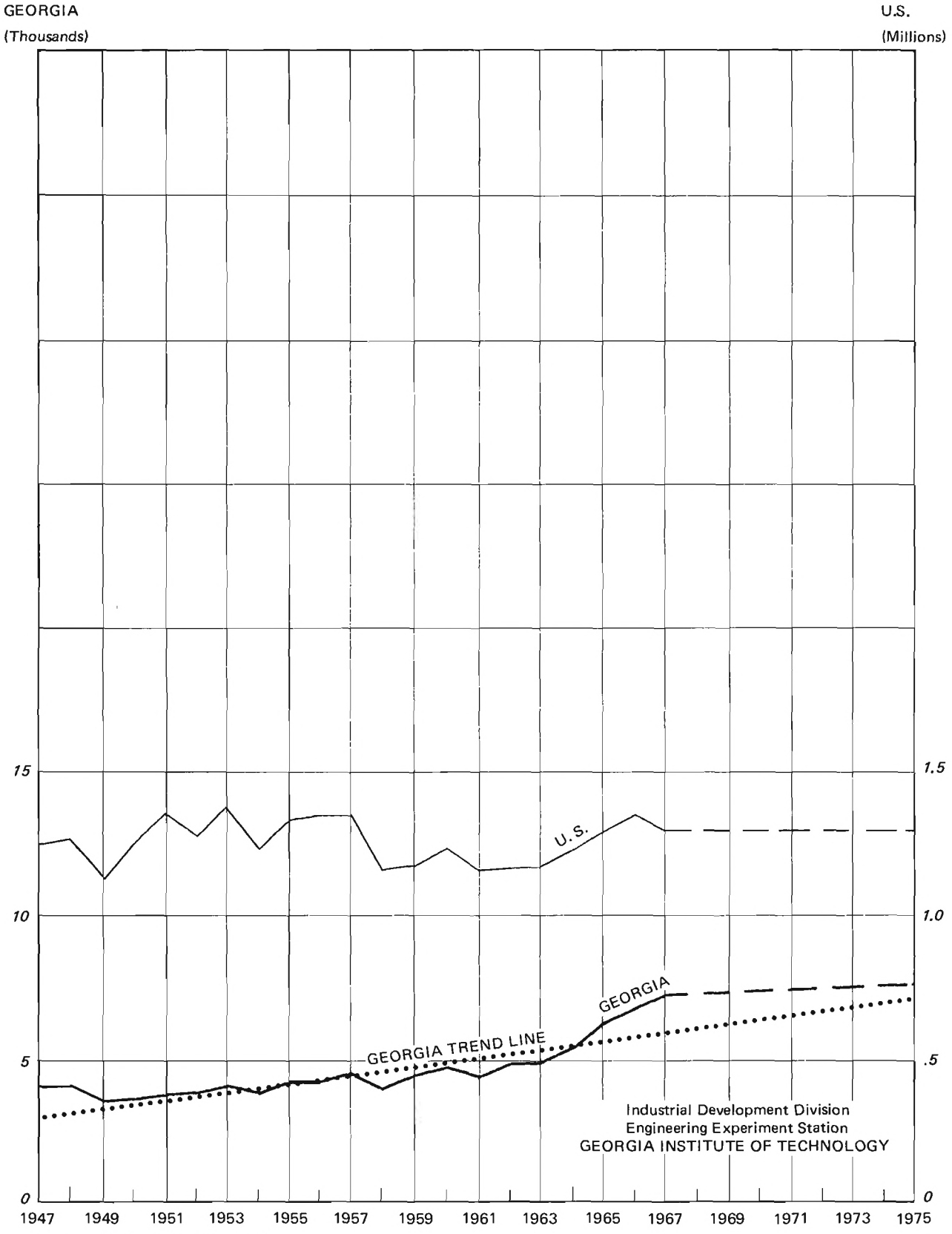
Output of concrete, gypsum, and plaster products has been expanding rapidly, and its growth is expected to continue. Demand has been stimulated by technological advances which have improved the quality and also promoted new uses for the products. Prestressed concrete (concrete reinforced with tensioned steel) and other prefabricated concrete and gypsum products appear to have a particularly bright future.

In this section of the industry, the increased demand is expected to cause an increase in employment. Many unskilled jobs will disappear, however, and

the new openings will be for skilled mechanics and maintenance personnel capable of handling electronic equipment.

Georgia's employment in the stone, clay, and glass industry has grown substantially during the past 20 years, from 7,200 in 1947 to 14,200 in 1967. The number of U. S. workers increased to a lesser degree during the same period, and Georgia's proportion of national employment climbed from 1.34% in 1947 to 2.25% in 1967. Projected to 1975, Georgia's employment trend indicates some 17,100 workers at that date. On the basis of the state's increasing proportion of national employment in the industry, the figure would be somewhat higher -- some 17,900 workers, accounting for 2.65% of the U. S. total.

CHART 6
PRIMARY METALS EMPLOYMENT



Source: See Introduction, page 1.

PRIMARY METAL INDUSTRIES
(SIC 33)

The heavy investment involved in the plant and equipment of this industry group leads to caution in the adoption of any radical changes in production methods. A long period of research into new processes is necessary in order to avoid costly mistakes, and also to ensure that improvements can be worked out and incorporated into the new system before construction is too far advanced. In addition, new processes in the experimental stages may look so promising that changes involving proven new techniques may be shelved to await developments.

In the iron and steel industry the basic oxygen furnace was acknowledged some 15 years ago as being a big improvement over the open hearth furnace, giving faster production at lower cost. Conversion to this process has been growing steadily, but basic oxygen furnaces in 1967 still produced only one-third of the steel made in this country. Another process that promises major savings is continuous casting, but large-scale conversion to this method is expected to take several years. Since these and other technical advances are adopted slowly, output per man-hour can vary in different plants. The trend, however, is toward greater productivity with some reduction in employment involving a cutback of workers with low skills and an increase in those with professional and technical ability.

As the use of continuous casting is increased, it will reduce the volume of this work performed in foundries. Other technical advances in the foundry industry, however, are improving efficiency and extending the capabilities of this method of fabrication. Any employment increase will depend on the rate of growth of the metalworking industries; but in any event, there will be some reduction of unskilled jobs and a demand for more technical personnel.

Aluminum is in competition with steel, plastics, wood, glass, and copper, but its qualities of high strength in relation to light weight are bringing it into increasing use in construction work, transportation equipment, electrical equipment, machinery, containers and packaging, and a variety of other durable goods. The drive toward higher production to maintain and expand these markets has already brought many improvements in processing, but a major breakthrough is anticipated that will bring a dramatic increase in productivity. Several companies are working on methods of bypassing the electrolytic-reduction

process in the two-step bauxite-alumina-aluminum operation, and creating a one-step direct reduction of bauxite to aluminum. This would bring a major increase in output per man-hour, which is already showing rapid gains from other technological advances. No decrease in employment is anticipated, however, as growing demand is expected to parallel the increased output.

The net result of these developments in the primary metals industry is expected to be continued increases in output but a fairly stable employment figure. Georgia's employment in this industry totaled only 7,100 workers in 1967, up from 3,900 in 1947, and accounted for only a small fraction of U. S. employment -- 0.30% in 1947 and 0.55% in 1967. Projections based on the 1947-1967 trend in employment show 7,200 workers for the state in 1975. Projected on the basis of the state's proportion of national employment, however, the number of primary metal workers in Georgia in 1975 would be some 7,500, or 0.58% of the anticipated U. S. figure for that date.

CHART 7
FABRICATED METAL PRODUCTS EMPLOYMENT

Source: See Introduction, page 1.

FABRICATED METAL PRODUCTS
(SIC 34)

The products covered in this industrial category vary from metal cans, cutlery, and metal stampings to sheet metal work and prefabricated metal buildings. Competition exists, both internally between different metals and externally from products made of plastic, glass, wood, and stone. Developments in these other materials, then, can influence the future demand for different classes of metal products.

New uses for different metals are being found continually, however, and changes in methods of production are improving both the speed and quality of output. The use of metal has been pushed aggressively for the packaging of soft drinks, beer, and aerosols. Easy-opening tops have been featured, and production costs are being cut by new techniques of either cementing side seams or welding them electronically.

Coating and plating processes are already highly mechanized, and the demand anticipated for these services will increase the number of employees.

The job shop type of production, where a variety of different metal parts are produced in small volume, is being radically changed by the advent of numerically controlled machine tools. This system of numerical control is a major advance in machining operations whereby the tools function according to coded instructions on tape. Substantial savings are possible in unit labor requirements and in all types of tooling costs. The work done is more accurate, and production possibilities are more flexible.

As this system becomes more widely used, the number of jobs for machine tool operators, tool and die makers, and production and toolroom machinists will be reduced, and new positions will open up for engineers and programmers.

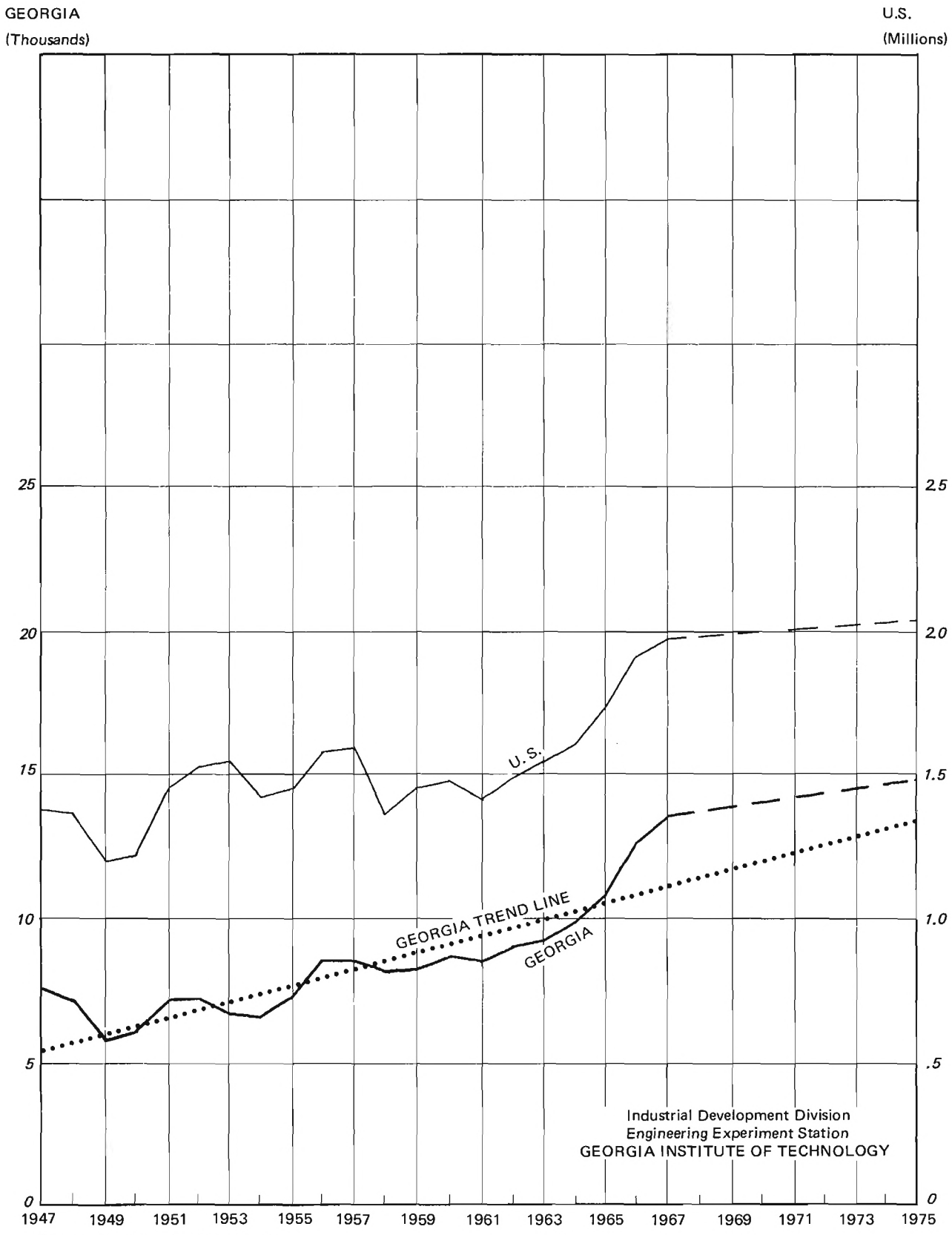
Other new tools that are changing the present ways of metalworking include electron guns, lasers, super magnets, electrical discharge tools, electrochemical tools, and ultrasonic vibrators. Some of them have been developed to handle special "space-age" requirements, and it may be some time before they become economically adaptable for more conventional use, but from an employment point of view the growing need is for highly skilled operators.

Employment growth will vary in different sections of this industry. As the new technological developments are adopted more widely, the output per

worker will increase, but the overall demand for metal products will also mean a net increase in the number of workers.

Georgia's share in this industry is not large but is showing strong growth. Employment in 1967 was 14,500 workers compared with only 3,600 in 1947, and its proportion of the U. S. had climbed from 0.36% to 1.07% in the 20-year period. The straight line employment growth trend shows some 16,500 workers in the state in 1975. A projection of Georgia's proportion of the U. S., however, gives Georgia 1.27% of the nation's fabricated metal workers at that date, indicating a higher figure of over 18,500 workers.

CHART 8
NONELECTRICAL MACHINERY EMPLOYMENT



Source: See Introduction, page 1.

MACHINERY, EXCEPT ELECTRICAL
(SIC 35)

The demand for all kinds of machinery and related equipment is expected to show strong growth. The increase in population will expand the need for all types of goods and hence for the machinery used in their production. In addition, the many technological advances made in this field in recent years have made a high proportion of the machinery in current use obsolete, and it will need to be replaced for the manufacturers to remain competitive.

Many of these new machines are mentioned in other sections of this report as part of the developments influencing production in other industries. One of the more important is the numerical control of machine tools -- whereby the tools are electronically activated and controlled by means of changeable tapes on which directions have been punched. Substantial reductions of labor costs are possible by this method, and its use is expected to spread rapidly.

Many improvements, of course, do not depart radically from conventional designs but modify existing equipment by increasing the size or the speed of operation, or by integrating a number of separate operations into the functioning of one machine.

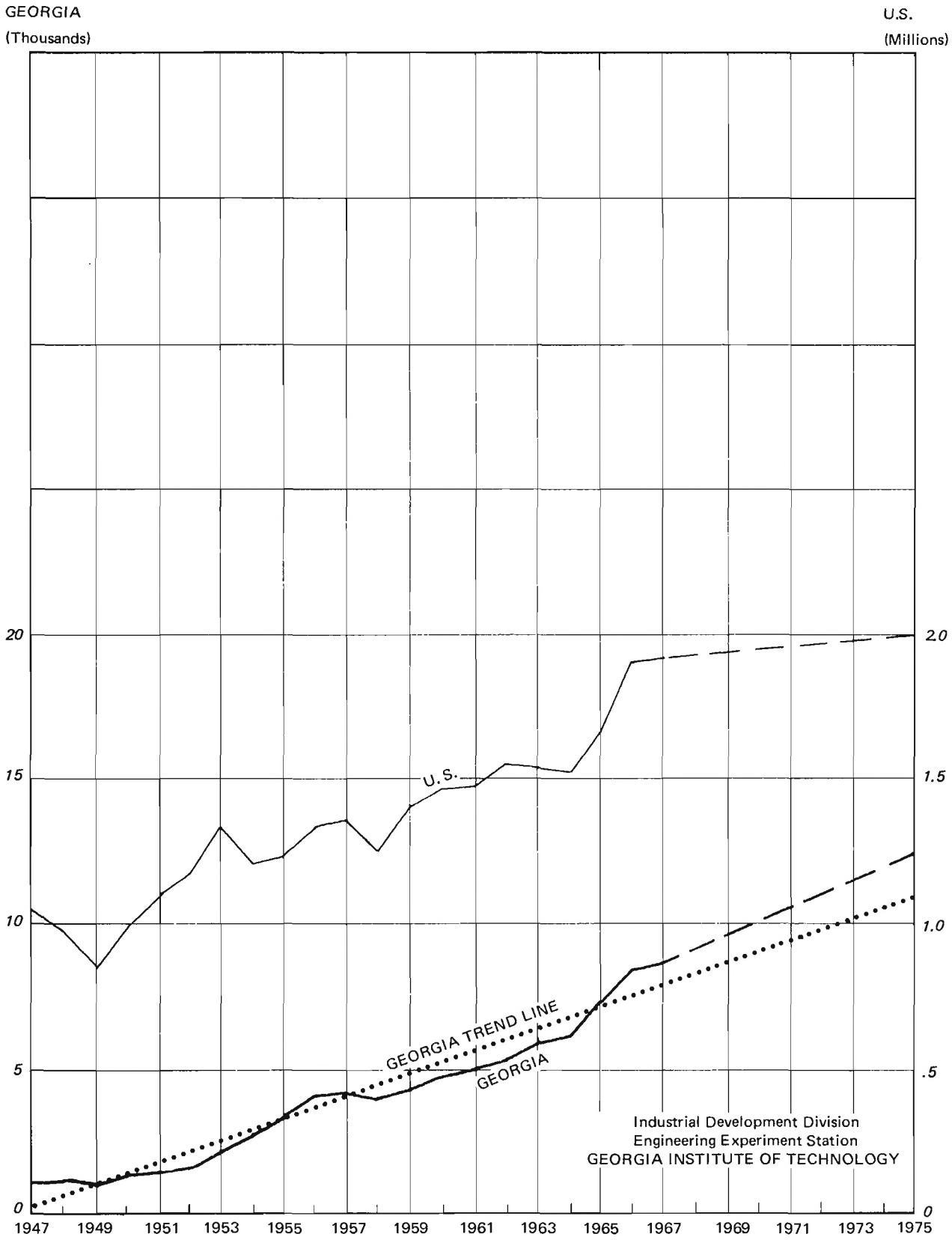
One innovation likely to be widely adopted by manufacturers producing large quantities of a standardized product is the use of automatic transfer equipment. With this equipment the material is passed automatically from one machine to another for successive operations to be performed.

Faster, larger-capacity machines are already speeding production in textiles and in the manufacture of tires and tubes. Continuous operation equipment has been developed for work as diverse as the casting of steel, the production of frankfurters, and the mining of coal. Tape-controlled linecasting machines set type automatically in printing plants, and mechanical lumberjacks fell trees, delimb them, and cut them into six- to eight-foot lengths. The list of technological innovations is extraordinary and is constantly being extended.

The machinery industry itself will, of course, use many laborsaving devices on its own production lines, and while employment is expected to increase, its growth will not be as rapid as that of output. Many of the new jobs will be for engineers, programmers, and highly skilled technicians rather than machinists.

Georgia's employment in this industry was 7,500 workers in 1947 and increased to 13,400 workers in 1967. Although this growth was at a faster rate than that of the industry in the U. S. as a whole, the state's proportion of U. S. employment was only 0.68% in 1967 -- an increase from 0.55% in 1947. Projections based on the 1947-1967 employment trend (which was not consistently upward -- see chart) indicate little gain from the 1967 figure of 13,400 workers. But on the basis of the increasing proportion of the national total, Georgia's workers in 1975 would number some 14,800, representing 0.72% of the U. S. employment in this industry.

CHART 9
ELECTRICAL MACHINERY, EQUIPMENT, AND SUPPLIES EMPLOYMENT



Source: See Introduction, page 1.

ELECTRICAL MACHINERY, EQUIPMENT, AND SUPPLIES (SIC 36)

Production in this industry should continue to show substantial growth. Major technological advances will increase output per man-hour, but the demand for electrical products will be strong enough to cause a rise in the number of employees. In addition to the direct requirements of the growing population for radios, television sets, household appliances, and all the electrical items required in new home construction, demand will be stimulated by the automation of many industrial processes.

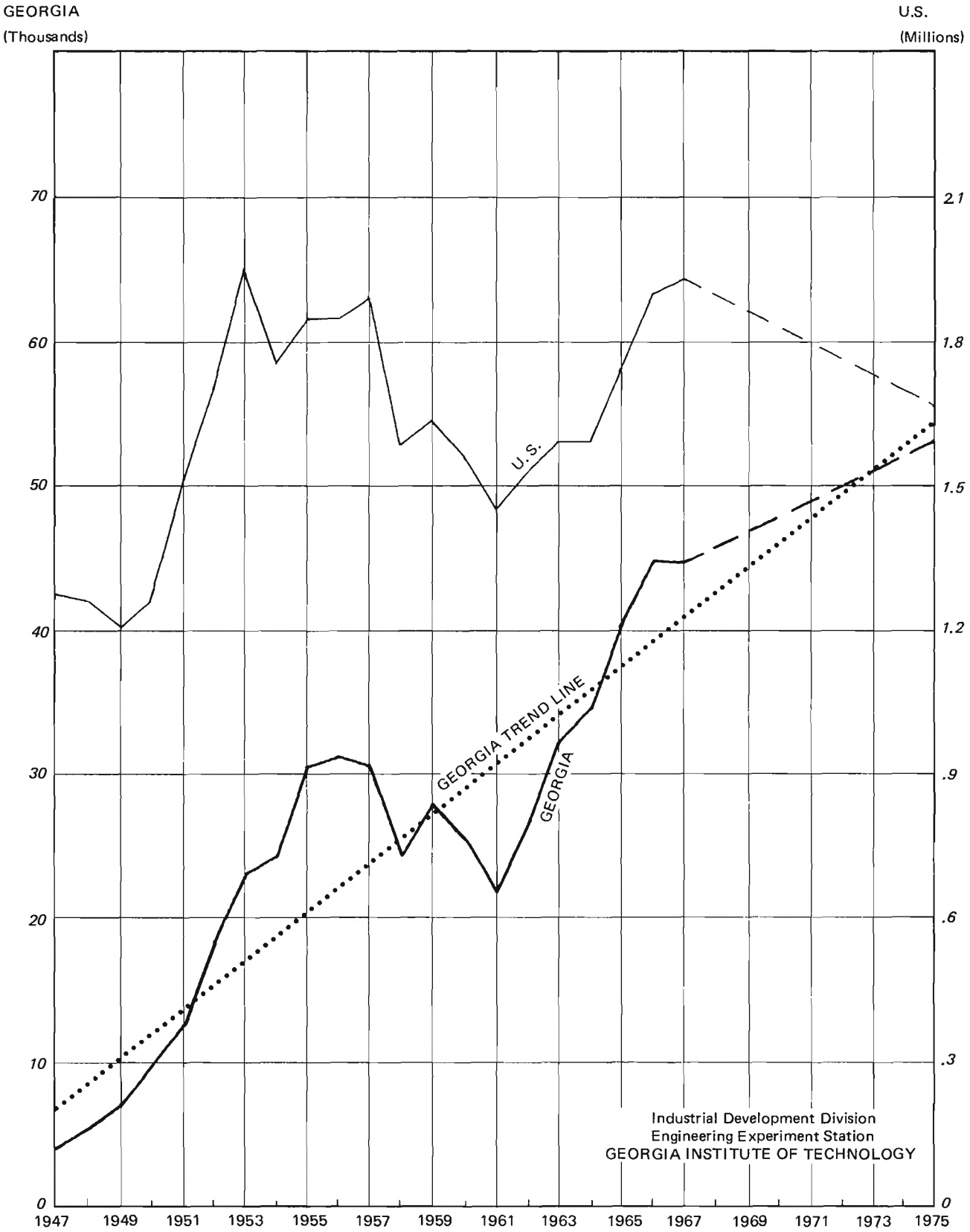
Systems of automatic operation and control being built for use in other industries also will be part of the production lines of this industry. Numerically controlled machine tools are already being used extensively in plants making communication equipment, and mechanization of the assembly of component parts is reducing manpower requirements in the building of many electrical machines.

New devices are creating new markets or, in some cases, cutting in on established markets by the development of a better product. Major advances have been made as a result of work for the military and for the space program. One of the most important is the "integrated circuit" which combines hundreds of transistors and other interconnected circuit elements on tiny chips of silicon. The whole field of microelectronics is expected to develop in many different ways for use in industry -- at present the biggest users are the military and the computer manufacturers. Although the manufacturing processes are highly complicated, the production of microelectronic circuitry is expected to become increasingly mechanized, and the capabilities of the product compared with earlier devices mean significant labor savings when related to the high use level of the output.

As indicated earlier, however, the demand for this industry's products is enormous, as luxury items for the consumer become standard conveniences, and specialized, sophisticated equipment becomes a basic part of industrial machinery. Labor requirements are expected to increase, but the emphasis will be on scientists and electronic technicians rather than machine operators and materials handlers. Opportunities for women may increase in nonautomated assembly work because of their aptitude in handling miniaturized products.

Georgia's share in this industry is small, but showing good growth. In 1947 Georgia had 1,100 workers, only 0.11% of the U. S. total; by 1967 employment reached 8,700 workers and accounted for 0.45% of the U. S. figure. The straight line employment trend indicates some 10,900 workers by 1975, but the projected proportion of the U. S. employment by this date is 0.62%, or some 12,400 workers for the state.

CHART 10
TRANSPORTATION EQUIPMENT EMPLOYMENT



Source: See Introduction, page 1.

TRANSPORTATION EQUIPMENT
(SIC 37)

Current figures for employment in this industry are abnormal, due to military requirements for the Vietnam War, and the situation in the years immediately ahead depends not only upon the conclusion of the war but also upon the defense policies and space activities pursued thereafter by the administration.

Technological advances will continue to increase the output per man-hour and thereby modify employment growth. In the motor vehicle industry, the greater use of computers and numerically controlled machine tools, combined with the adoption of new materials and new manufacturing processes that improve production efficiency, will boost output to meet increased demand. Although employment may fluctuate -- following changes in demand (including military demand) as well as improved technology -- the general trend is likely to show a leveling off. An internal shift in occupational structure will continue, however, with a higher proportion of scientists, research engineers, and programmers, and reductions in many categories of production workers.

Numerically controlled tools are already being used in the aircraft industry and their use is expected to become even more widespread, reducing labor requirements to a marked degree in many types of processing. Other technological changes include welding and cutting with electron beams, chemical milling, and electrochemical machining. Miniaturized electronic equipment developed for the space industry is of increasing importance in aircraft, and continued emphasis on research and development is likely to bring many more innovations. New materials are being created and tested; these, in turn, cause the development of new methods of fabrication.

In general, these advanced processes mean higher skill levels and a net reduction in the number of employees. This section of the transportation equipment industry is particularly vulnerable to government policy changes; but if defense requirements return (after the end of the Vietnam War) to prewar levels, employment can be expected to show a downward trend.

Laborsaving developments in shipbuilding are chiefly concerned with modified mass production and materials handling at ground level. Considerable capital outlay is required, however, which would not be warranted by the average shipbuilder under present limited ship construction plans. The policies of the

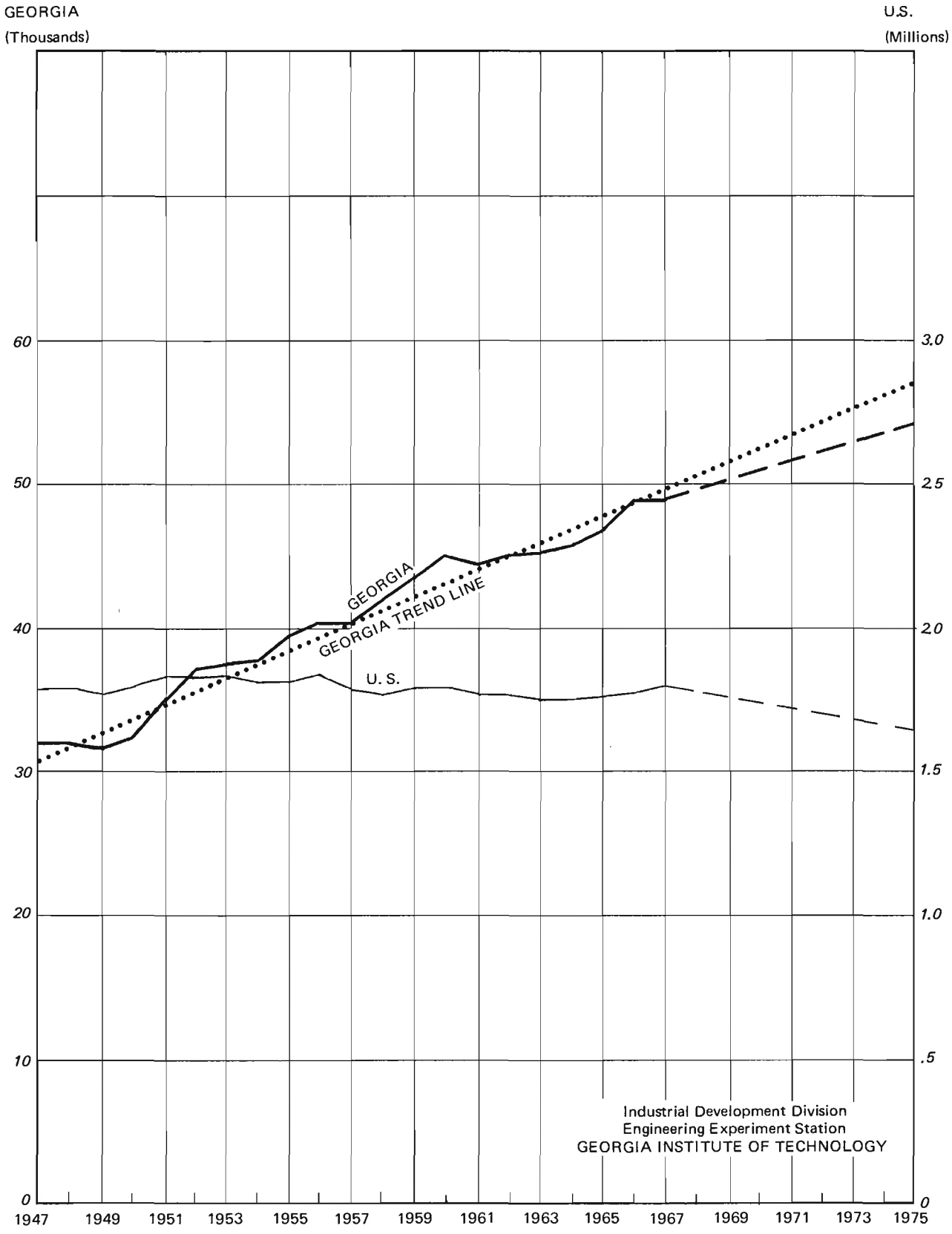
new federal administration that recently took office may change this picture, especially in view of the tremendous expansion in Soviet shipping.

Mass production techniques have only limited potential in the railroad equipment industry, except in subassembly and component production -- operations which are already automated.

The total outlook in the transportation equipment industry indicates a decline in employment from present levels once the Vietnam buildup has been reduced. In Georgia, however, the trend is upward. In 1947 there were only 3,900 workers in this industry in the state; in 1967 the figure was 44,800; by 1975, if this trend is continued, there will be some 56,900 workers. As a proportion of the nation Georgia climbed from 0.31% in 1947 to 2.33% in 1967. Projected on this basis, the state will have a somewhat lesser number of workers in 1975 -- some 55,700, representing 3.22% of the projected U. S. figure at that date.

It should be emphasized that the assumptions on government policies built into these projections are substantial. The Georgia figures, of course, include Lockheed, where gain or loss of government contracts can mean a difference of thousands of workers.

CHART 11
FOOD AND KINDRED PRODUCTS EMPLOYMENT



Source: See Introduction, page 1.

FOOD AND KINDRED PRODUCTS
(SIC 20)

The overall pattern of development in the food industry is one of increased production in line with the population growth, increased output per man-hour resulting from technological advances, and a decrease in employment as automated processes become part of the modernized plants.

In the meat products industry, per capita consumption is rising, adding to the demand of a growing population. At the same time, the processing of meat and poultry is expanding so that more and more products are sold as prepared foods, cutting down kitchen work in homes and restaurants. Mechanized systems are being used from the original slaughtering of the cattle to the mass production of sausages. The closing of obsolete meat-packing plants will continue to cause unemployment problems since skill in meat handling is not readily transferable to jobs in other industries. Employment in prepared meats and poultry should remain fairly steady, with possibly some shifting of job location from retail stores to factory processing departments.

Centralized control systems and continuous processing methods in large plants will increase output in the dairy industry and at the same time cause a reduction in employment. Many semiskilled and unskilled jobs in materials handling and cleaning will be eliminated and the number of routemen is likely to decline as more sales are made through supermarkets.

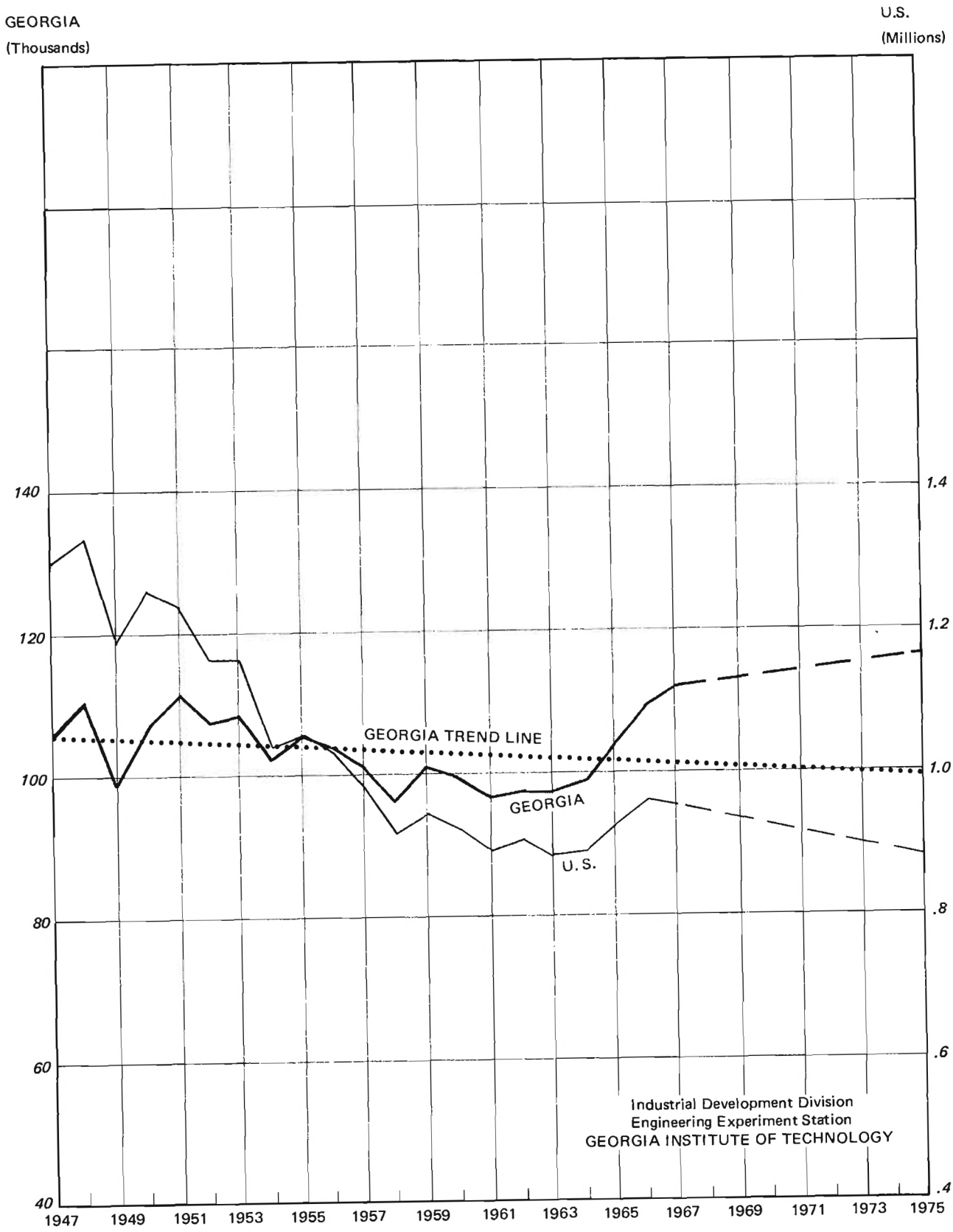
The rise in production of bakery products will be accompanied by a continuing decline in employment as more mechanized plants are built and old plants are modernized. The major grain mills are modernizing and putting in new methods of control which will cause an increase in output, but a decrease in employment.

Although individual sections of the industry may not adhere to the general pattern, the total figures for the U. S. are expected to show a continuing decline to 1975. Peak employment in the past two decades was in 1956, with an annual average of 1,841,900 workers. Current figures show a modest gain to 1,789,100 in 1967 from a low of 1,750,400 in 1964. By 1975 this figure is expected to drop to 1,665,000 workers.

Georgia's share of the industry, however, has been climbing in the past 20 years. Employment increased by 52.6% between 1947 and 1967, from 32,100 to

49,000 workers. As a proportion of U. S. workers these figures show a rise from 1.78% in 1947 to 2.74% in 1967. If this trend is projected to 1975, Georgia's employment will increase to over 56,800 workers. Projections of Georgia's proportion of U. S. employment, on the other hand, show the state with 3.24% of the industry's workers by 1975; the overall decline in food production employment, however, equates this higher percentage with just under 54,000 workers.

CHART 12
TEXTILE MILL PRODUCTS EMPLOYMENT



Source: See Introduction, page 1.

TEXTILE MILL PRODUCTS
(SIC 22)

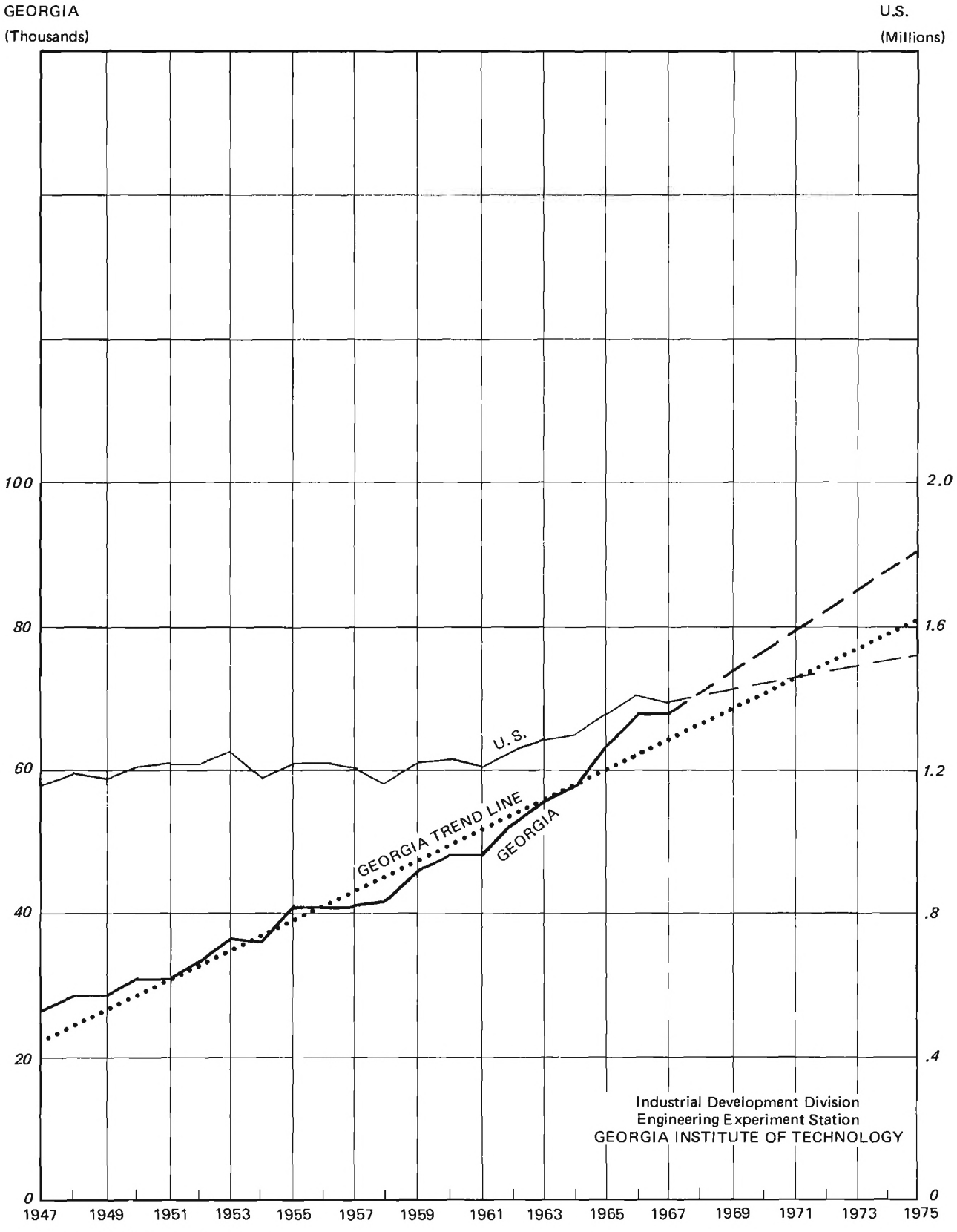
Employment in the textile industry on a national level is expected to continue to decline, though at a more moderate rate than in the years immediately following World War II. There is a continuing trend toward expansions and mergers -- to combine manufacturing processes, to finance the modernization of machinery, and also to achieve greater diversification as a safeguard against a drop in demand in any segment of the textile market. Foreign competition has stimulated technological improvements and the use of larger-capacity, high-speed machines. The old processes calling for large groups of spinners and weavers with a high degree of manual dexterity are changing. Separate operations are being consolidated into more continuous automatic manufacture where a limited number of operators watch the machines to detect malfunctioning. The use of electronic monitoring systems for quality control is expected to become more widespread.

These changes, however, have also caused an increasing demand for engineers, technicians, skilled maintenance men, and operators who can be trained to service the complex textile machinery.

Georgia's textile employment has decreased far more gradually than that of the U. S., and current figures show that the recent climb in the number of textile workers has been maintained (amounting to 112,100 employees in 1967), although the U. S. figures showed a drop in 1967. Georgia's favorable position in this industry has been helped by the growth of tufted carpeting. Separate figures for employment in Georgia's floor covering mills were first published by the Labor Department for 1961 when the state had one-third of the nation's workers. By 1967 Georgia's employment had increased by some 62% and its 19,400 workers accounted for 43% of this U. S. industry.

As the chart indicates, however, Georgia's trend line for all textile employment since 1947 shows a gradual loss which would bring the state figure to less than 99,300 workers by 1975. Georgia's proportion of the total textile employment of the U. S., however, has been growing steadily. Based on this trend, the state should have some 116,000 employees by 1975 -- over 13.0% of the projected U. S. figure of 880,000 workers compared with 11.8% of the nation's 951,500 textile employees in 1967.

CHART 13
APPAREL EMPLOYMENT



Source: See Introduction, page 1.

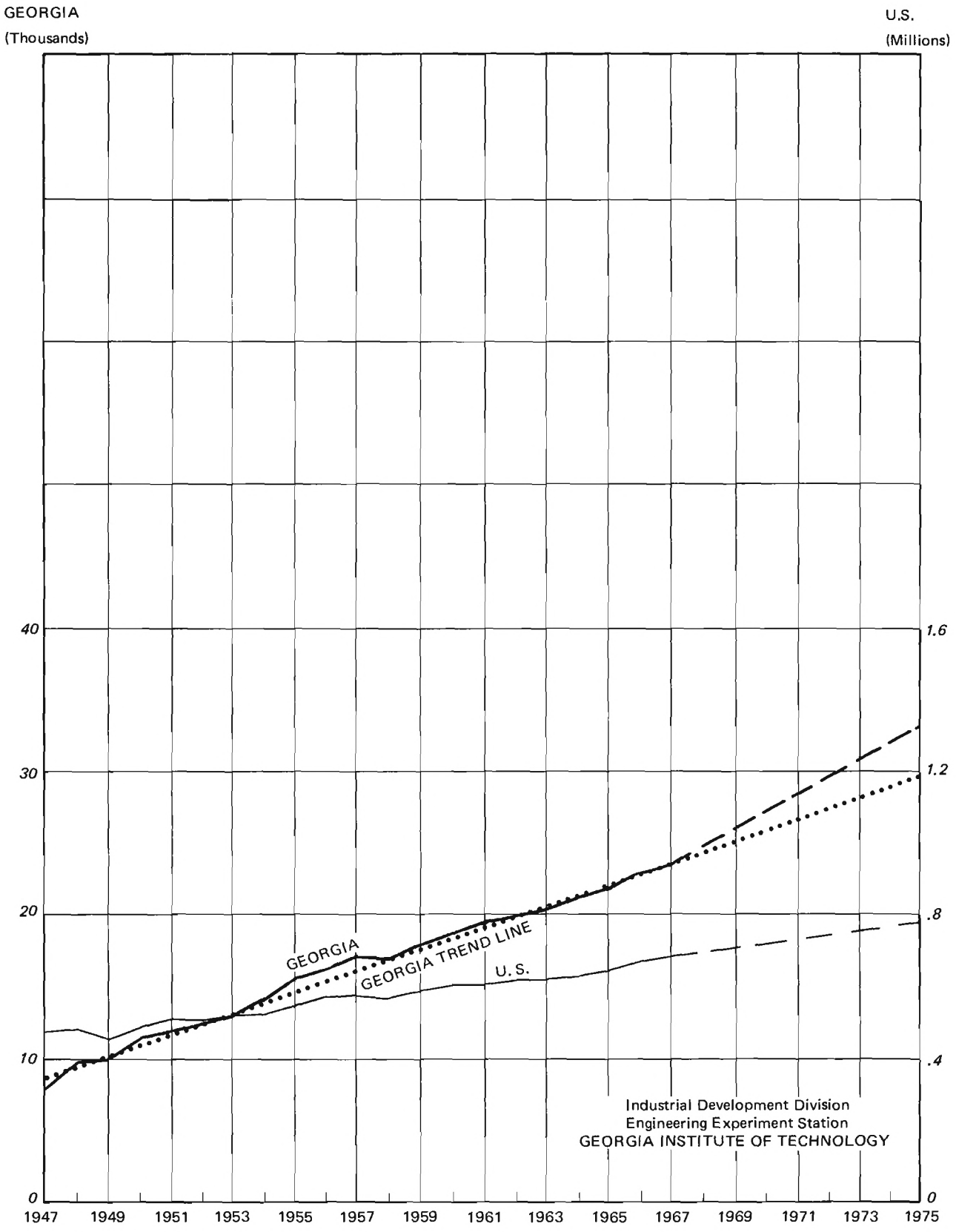
APPAREL AND RELATED PRODUCTS
(SIC 23)

Expansions, acquisitions, and mergers have increased the size of many apparel firms throughout the U. S., and many of these larger companies have installed automatic equipment to increase productivity. These large-scale, mechanized plants usually are engaged in the production of standardized types of clothing such as shirts, pajamas, work clothing, underwear, and other items that can be produced in large quantitites for inventory against future orders.

Thousands of small firms, however, are likely to continue their operations without extensive mechanization because they are handling clothing of various types and sizes, with frequent style changes that mean short production runs. Small laborsaving devices will continue to improve productivity, and the continuing use of bonded fabrics can reduce cutting and sewing time. If industry research can develop a satisfactory method of fusing the seams of clothing made from synthetic fabrics, this would, of course, reduce substantially the labor costs in the making of such garments.

The demand for apparel will expand with the increasing population, and is expected to outweigh any reduction in labor resulting from technological changes. Georgia has been getting an increasing share of the gradually rising employment in this industry (see chart). If the state's 1947-1967 employment trend is continued to 1975, the number of workers in apparel manufacturing will be nearly 80,300, compared with 67,500 in 1967. If Georgia continues to claim an increasing proportion of all apparel workers in the U. S., its employment will reach over 90,100 in 1975 -- approximately 5.9% of the projected U. S. figure of 1,525,000 employees compared with 4.8% in 1967 and 2.3% back in 1947.

CHART 14
PAPER AND ALLIED PRODUCTS EMPLOYMENT



Source: See Introduction, page 1.

PAPER AND ALLIED PRODUCTS
(SIC 26)

Extensive mechanization is already taking place in the paper industry, and output per man-hour is expected to increase substantially in the years ahead as production facilities are modernized. Demand will more than keep pace with productivity, due to increased per capita consumption of paper and paper products, growth of the population, and expansion of exports.

Continuous pulping systems in the mills not only reduce labor costs but also increase the fiber yield. Mechanized handling systems and high-speed papermaking machinery are also expanding output per worker. A semichemical pulping process is producing a higher pulpwood yield, and the use of wood residues is achieving savings in both capital and labor.

Paperboard containers and boxes and converted paper products face stiff competition from other materials, and manufacturing processes are continually being improved in attempts to retain and expand the market.

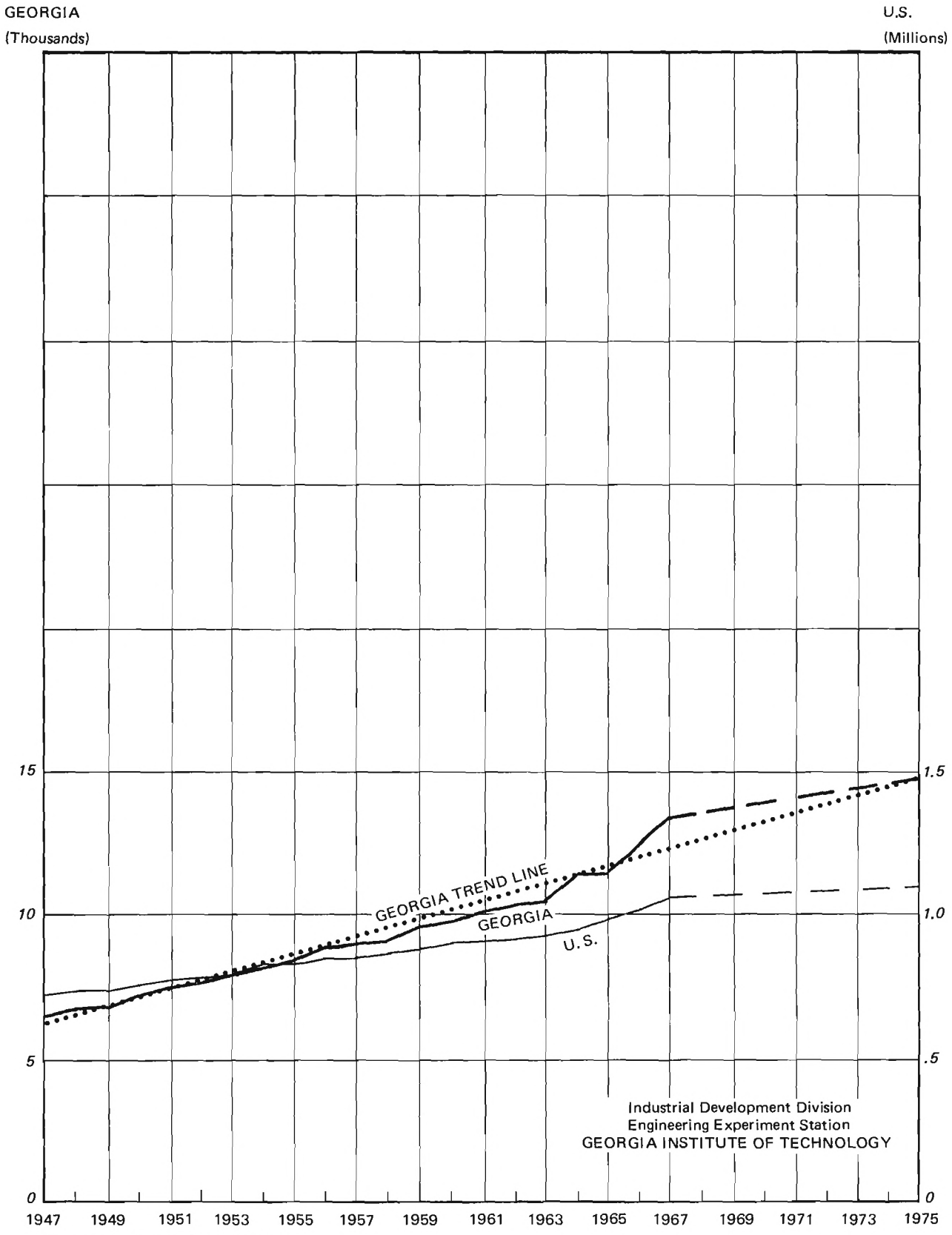
Expenditures on research and development in the industry have increased substantially, concentrated to a great degree on developing new paper products, including combinations of paper with plastics and metals, but also tackling such problems as waste disposal and pollution.

The net result of these changes will be a gain in employment in spite of the increases in output per man-hour. The employment gain will include a considerable shifting of job duties, however, with many new positions for scientists and technicians and fewer jobs for unskilled and semiskilled workers.

Georgia has already benefited from research by the paper industry. Uses for southern timber were limited because the fibers were coarse and hard to bleach until it was found that the pulp could be treated with chemicals and thereafter be used for almost any type of paper. The expansion of the paper industry in Georgia has boosted employment from 7,600 in 1947 to 23,600 in 1967 -- an increase of 211%. These figures represent 1.63% of U. S. employment in the industry in 1947 and 3.45% in 1967.

Georgia's 1975 employment, based on the 1947-1967 trend, would be some 29,600 workers. The state's increasing share of the growing U. S. employment in this industry, however, leads to a higher projection of 33,100 workers -- 4.27% of the estimated U. S. employment in 1975.

CHART 15
PRINTING AND PUBLISHING EMPLOYMENT



Source: See Introduction, page 1.

PRINTING, PUBLISHING, AND ALLIED INDUSTRIES (SIC 27)

Employment in the printing and publishing industry is expected to increase, but its rate of growth will be much lower than that of production as new technological processes come into greater use.

Electronic computers that prepare control tapes for guiding typesetting machines have been available for several years, and their use in the newspaper publishing business is expanding. Even small plants are receiving this service by means of computer centers.

Letterpresses are being superseded by the faster and more adaptable offset lithographic printing process. Improved metal typesetting machines are now on the market, but they are finding strong competition in the photocomposition process, which offers even greater potential economies and versatility. Binding and finishing operations are becoming increasingly mechanized, with multipurpose machines replacing smaller machines and manual work. The demand for more color printing is being met by equipment providing automatic color separation, a cheaper process enabling small shops to make greater use of color.

The demand for books, magazines, newspapers, and other printed matter will rise not only with the increase in population but also with higher levels of education, greater leisure time, and gains in per capita income. Major increases in production will be possible with the new technological processes, and with a comparatively modest increase in the number of workers. Expanded training programs will be necessary, however, to teach the new skills required to operate the advanced types of printing equipment, so that workers whose jobs are eliminated will be able to adjust to the changes taking place.

Employment in Georgia in printing and publishing has been increasing steadily over the past 20 years -- from 6,500 workers in 1947 to 13,400 in 1967. As a proportion of national employment in this industry, however, these figures represent 0.90% and 1.26%, respectively, still considerably below Georgia's current proportion of 2.28% of the U. S. population. By 1975, on the basis of the 1947-1967 employment trend, Georgia should have some 14,800 workers in printing and publishing. In this case the trend based on the proportion of U. S. workers in the state gives a similar figure, which would be some 1.35% of the projected employment for the U. S. at that date.

CHART 16
CHEMICALS AND ALLIED PRODUCTS EMPLOYMENT

Source: See Introduction, page 1.

CHEMICALS AND ALLIED PRODUCTS
(SIC 28)

Research and development play an important role in the chemical and allied products industry. There is a continual search for new and improved products -- synthetic materials to replace natural products or other synthetics, cheaper ways of processing basic chemicals, new or improved drugs. Since many developments originating in this industry are eventually used in other industries, this active research program is of vital importance to the economy.

Industrial chemicals are used by most other manufacturing industries, and expansion of output is expected to parallel the general economic growth of the nation. The increase in employment will be more modest because continual improvements in processing will tend to cut labor costs.

New and improved synthetic materials are following one another in rapid succession. They are competing with, and in some cases replacing, metals, glass, wood, and other materials. Improved methods of modifying the synthetic materials continue to stimulate the demand, and new equipment for faster production boosts supplies as well as the output per man-hour. This part of the chemical industry is expected to continue its rapid growth, resulting in increased employment in spite of the gain in output per man-hour. The emphasis on research work and the complexity of the instruments and machinery used will bring a continual demand for workers with higher skills. Some companies are already providing regular retraining programs for their workers in an attempt to keep pace with changes in technology.

The outlook in the drug industry is for continued growth in both production and employment. The universal concern for better health, the greater drug needs of the ever-increasing ranks of the older population, and the use of new drugs in the fight against disease are all part of a growing demand. Research and development activity is of major importance, not only to discover new drugs, but also to improve production methods, since the industry is under continual pressure to reduce the price of drugs to the consumer.

The output of soaps and detergents is expected to grow with the population, but since the industry is already highly automated, little change is expected in the number of employees. Fashion changes promoted by the manufacturers of cosmetics and other toilet preparations should mean continued expansion in this

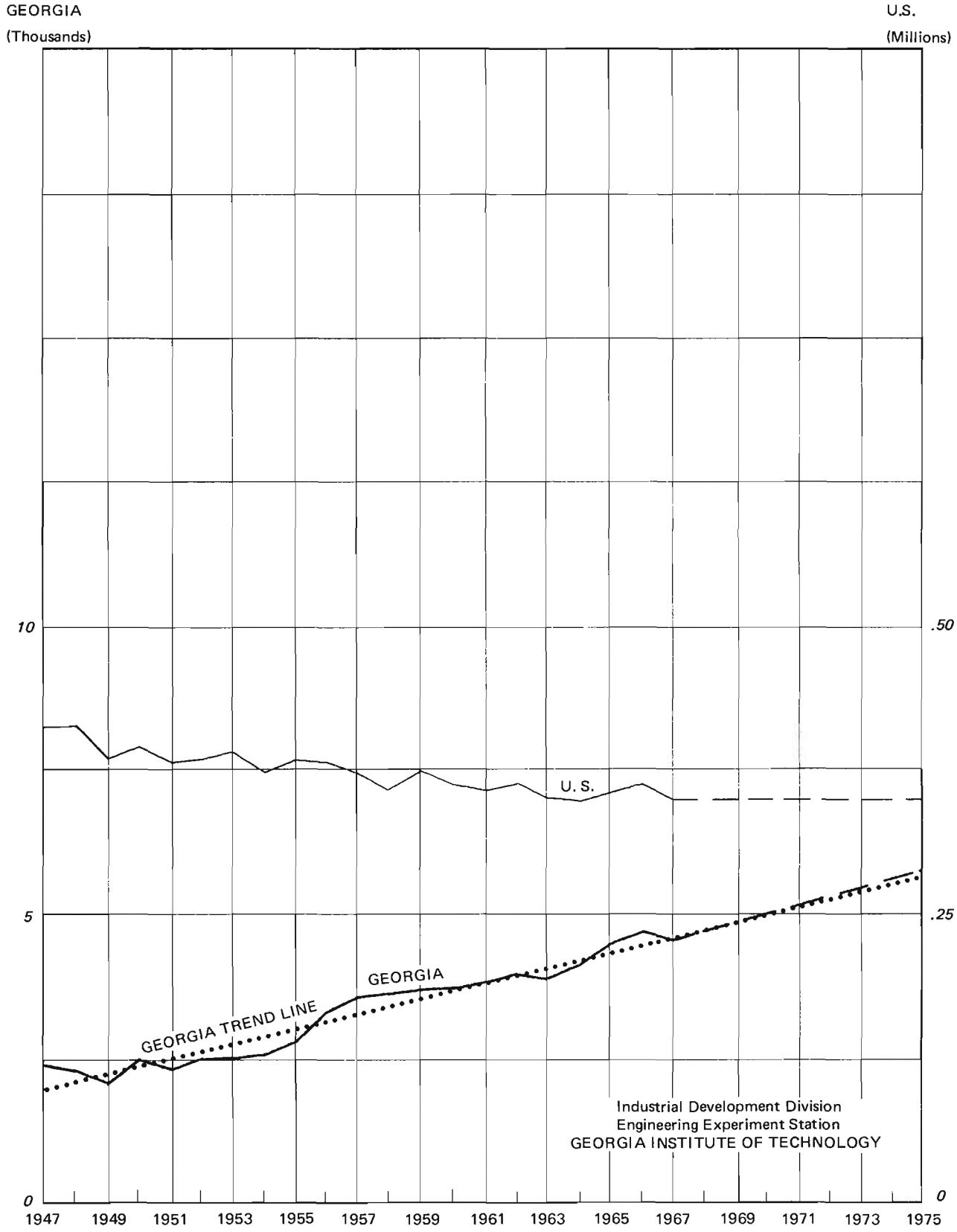
field; although processing innovations will reduce labor costs, some increase in employment is expected.

The paint and allied products industry faces growing competition from plastic, aluminum, and glass products. Research has been aimed at developing specialized chemical coatings or finishes with insulating properties, or resistance to corrosion or heat, intended for factory application on a variety of products. These precoated materials have cut into the demand for paints by contractors and homeowners, but this market is being sought by new developments in long-lasting, economical coatings that are easy to apply. Comparatively slow growth in employment is expected in this industry.

The increasing demand for fertilizers has been met by new methods of handling the materials. Bulk blending in automated plants has caused a steady increase in the output per employee, and continuing improvement in operating techniques is likely to limit employment growth.

The combined results of these developments in the chemical industry should lead to a steady increase in employment. Georgia's share in this employment, however, has varied in the past 20 years. While the overall trend in absolute figures shows a modest increase, the state's proportion of national employment has declined. Estimates for Georgia's 1975 chemical employment based on these two trends are very close: 13,500 workers if the trend is based directly on employment data; 13,800 if the basis of the estimate is the state's declining proportion of the increasing national figure. The 1967 Georgia figure was 12,500.

CHART 17
LEATHER AND LEATHER PRODUCTS EMPLOYMENT



Source: See Introduction, page 1.

LEATHER AND LEATHER PRODUCTS
(SIC 31)

Shoe manufacturers employ roughly two-thirds of the workers in the leather and leather products industry. Since shoes must be made to fit a wide range of foot shapes and sizes, completely automated operations have not been feasible. Partial automation has been developed, however, with several operations combined on one machine and with mechanized equipment conveying the work from one operation to the next.

The growth of synthetic materials as substitutes for leather has increased the possibilities of greater automation not only in shoe production, but also in the manufacture of other "leather" items. The man-made materials generally cost less than leather and, because they are uniform in size and quality, several layers can be machine cut with a minimum of waste.

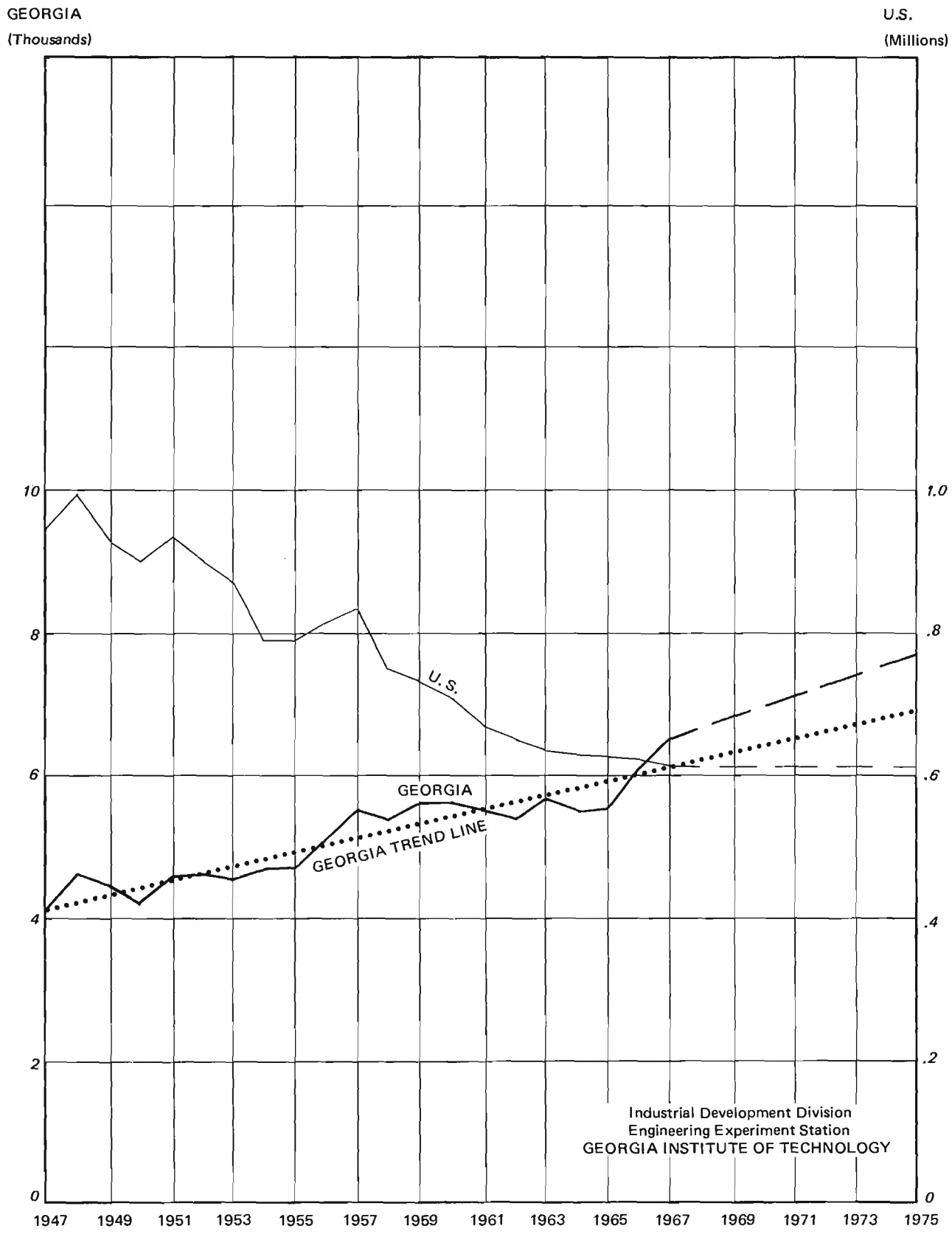
The demand in this industry is closely related to population size, and output should grow steadily as the population increases. Products from abroad are expected to take some of the market, however. There also will be continued competition from items made of rubber (particularly low-cost rubber shoes). These factors, plus the improved output per man-hour as a result of increasing automation, will keep the number of workers close to its current level.

Employment in the leather and leather products industry in Georgia is currently only 1% of the state's total manufacturing workers. The 1967 figure of 4,600 workers is, however, nearly double that of 1947, representing an increase from 0.58% to 1.31% of the total U. S. workers in the industry. Based on the 1947-1967 trend, Georgia's 1975 employment will be some 5,700 workers. A projection based on the increasing proportion of national employment (which is not expected to vary greatly from its present level) indicates a similar figure of some 5,800 workers.

Part III

NONMANUFACTURING EMPLOYMENT

CHART 18
MINING EMPLOYMENT



Source: See Introduction, page 1.

MINING
(SIC Division B)

National employment in mining dropped from 955,000 workers in 1947 to 613,000 workers in 1967. Most of this decline was in coal mining, where output was also down in spite of major increases in output per man-hour. Substantial increases in mining output are expected to continue, but this will be due chiefly to the impact of technological developments. Employment in the mining and quarrying of nonmetallic minerals is likely to increase as the demand for construction materials rises. A modest increase is expected in the number of metal mining workers, but little change is anticipated in crude petroleum and natural gas employment, and labor needs in coal mining are expected to continue to decline.

Technological developments not only are reducing the number of workers while increasing output, but also are changing the occupational structure of the industry. The "lease automatic custody transfer" systems that pump, sample, monitor, and transfer crude oil directly from wells to the transmission pipelines reduce the number of men employed on intermediate jogs but increase the need for supervisors and maintenance mechanics. Complex exploratory and drilling devices require scientific personnel for their operation and reduce the need for unskilled workers.

Improvements in the mining of solid minerals include continuous mining machinery systems and power equipment for shoveling, drilling, and hoisting. A recent development is longwall mining where hydraulically powered roof supports move into place behind automatic cutters. Computers are being used increasingly to analyze and control the mining operations. All these developments tend to increase the need for skilled workers and specialists and reduce the number of unskilled jobs. A general increase in employment may result, however, from new techniques that make the mining of low-grade mineral deposits economical.

Georgia's mining interests are chiefly concerned with nonmetallic minerals. Employment since 1947 has shown a gradual increase, with a more substantial rise in the last two years (1965-1967). If the 20-year trend is projected to 1975, the mining employment will be some 6,900 workers, as compared with 6,500 in 1967. Georgia's proportion of the declining U. S. employment, however, rose from 0.43% in 1947 to 1.06% in 1967. A continuation of this trend would give the state 1.23% of national employment in this industry by 1975, or some 7,600 workers.

CHART 19
CONTRACT CONSTRUCTION EMPLOYMENT

Source: See Introduction, page 1.

CONTRACT CONSTRUCTION
(SIC Division C)

Construction work is expected to increase substantially -- to supply housing for the expanding population, to build new commercial and industrial facilities, and to fill the demand for new and improved schools and highways. Employment will continue to expand at a rapid rate, but part of the increased volume of work will be met by a greater output per worker as technological advances result in increased efficiency.

Major improvements in earth-moving equipment, for example, have multiplied the speed with which large or small excavation projects can be completed. Significant advances in paving methods are reducing costs and at the same time improving the quality of highways. The increasing use of tower cranes, which can deliver material where it is required up to a height of 330 feet, reduces the need for large crews of material handlers in the construction of tall buildings. Other mechanized handling equipment includes forklift trucks, motorized wheelbarrows, conveyor belts, and high-speed hoists.

Improvements are continually being made in hand tools which reduce both work time and labor requirements. Spray guns for both paint and plastics, power nailing and stapling machines, multiple-spindle drills, hydraulic joint forming machines, and powered concrete cutting saws are just a few of the devices that are changing the whole pattern of construction work.

One basic improvement that is spreading throughout the industry is a standardized system of measurement. This leads to obvious advantages in accuracy of design and cost estimates, and economies of mass production of materials. Mass production techniques are also producing significant savings in the prefabrication of buildings. Components can be delivered from the factory to be installed as complete units -- doors completely prehung in frames, with hardware attached; prewired switchboards and control panels; and preassembled plumbing "trees." Complete rooms and buildings are available in standard sizes and can be erected on a prepared site with considerable reductions in construction labor.

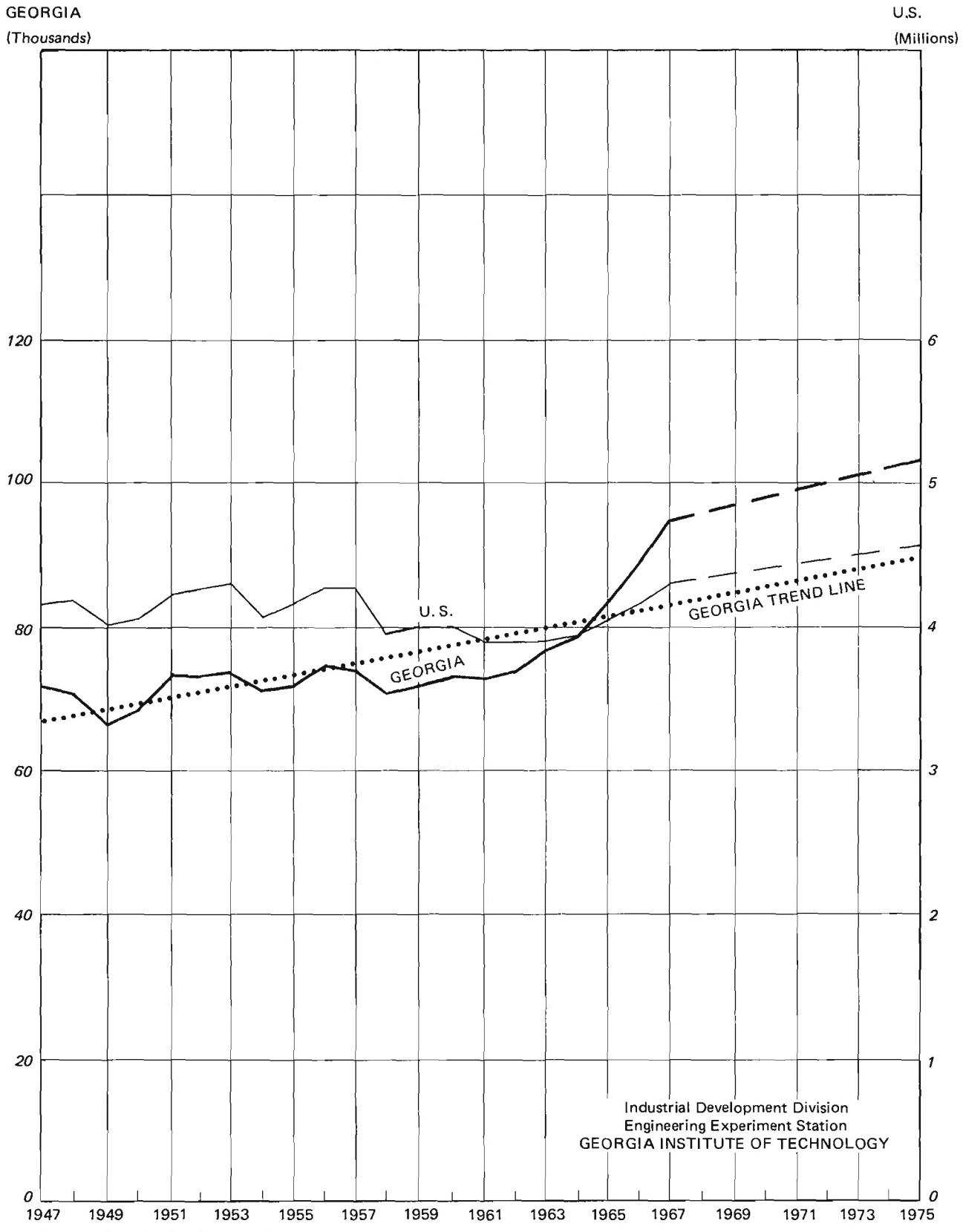
New and improved materials are combining reduced costs with better quality. Plastics are being used increasingly in a wide variety of building components, reducing the work of carpenters, plumbers, painters, electricians, and roofers.

Wood products are coated at the factory with long-lasting paints, and special adhesives give firm bonding without conventional fasteners. The expanded use of some of these new materials, however, is limited in some areas by outdated building codes. Opposition to new codes which specify performance rather than materials will probably be reduced as retraining programs introduce older craftsmen to the new techniques.

In general the technological developments, combined with the anticipated growth in construction, will increase the demand for highly skilled workers. Some changes will take place in the occupational structure of the industry as individual trades are affected by the new methods, and little or no expansion is expected in the employment of laborers. Work should be less seasonal, however, as special methods are adopted for winter construction -- such as the sheltering of sites by frames covered with sheet plastic.

In Georgia construction employment more than doubled between 1947 and 1967, rising from 36,000 to 74,800 workers. If this trend is continued to 1975, employment at that date will reach nearly 85,700 workers. The state has been increasing its proportion of the U. S. total, however -- from 1.82% in 1947 to 2.29% in 1967. On this basis, by 1975 its proportion of national employment would be 2.40%, representing some 100,600 workers.

CHART 20
TRANSPORTATION AND PUBLIC UTILITIES EMPLOYMENT



Source: See Introduction, page 1.

TRANSPORTATION AND PUBLIC UTILITIES
(SIC Division E)

National employment in the transportation and public utilities industries fluctuated above and below the 4 million mark between 1947 and 1967, beginning and ending the period with some 4.2 million workers. Employment trends in the subsidiary industries of this group varied widely, however, and although only a modest increase is expected in the total number of workers, major segments will continue to show considerable divergence in the years ahead.

Employment in railroad transportation has been declining for many years, partly due to technological advances which reduce labor requirements, but also because of the reduction in passenger traffic. Continued modernization of equipment, with centralized electronic control of traffic and the extended use of computers for processing operational data, will further reduce the number of workers. Other developments include more powerful locomotives, lightweight construction of high-capacity rolling stock, and automatic loading and unloading of containerized freight.

The idea of containerized freight has already been expanded into specialized services such as "piggybacking" (trailer-on-flatcar) and high-speed unit trains, which haul thousands of tons of one commodity from one large producer to one large consumer. These improved techniques are expected to draw an increasing share of the nation's expanding freight traffic, and the volume of trade will gradually reverse the downward trend in employment.

The demand for freight-hauling facilities in the next decade will be strong enough to enable the motor freight industry to increase its total volume of traffic, even with the railroads claiming a somewhat larger share. Employment will also continue to grow, though at a slower rate, being limited by the technological changes that are gradually being incorporated into the industry. Modifications include improved vehicle design, use of lighter-weight materials, special refrigerated and insulated trucks, convertible and collapsible tanks, standardized freight containers, and larger and more efficient terminals. Paper work is being speeded up by the use of computers for data processing, and preventive maintenance is saving costly road repairs.

The national system of interstate highways has enabled the truckers to increase the legal size and weight of their vehicles, and the industry is trying to get the use of tandem trailers ("doubles") accepted in all the states.

Employment in water transportation is expected to decline, partly because of modernization, but also because of the gradual reduction of ships operating under the U. S. flag. Oceangoing foreign ships can operate with lower costs, and there is a continuing trend for nonsubsidized U. S. ships to transfer to foreign registry or not to be replaced once they become too old or inefficient. Ships operating under government subsidy are being modernized by refitting or replacement. Automatic controls and other laborsaving devices reduce the number of men required on board and also the number of dockhands required for cargo handling. Savings by using standardized containers apply to inland water transportation as well as deep-sea vessels. The ease of loading such containers from factory to barge to ship is now being extended to the loading of the barges themselves onto specially built ships, to be unloaded at the port of destination for immediate movement along the inland waterways.

Technological changes will play an important part in the future of air transportation, and to a certain extent will limit employment growth. The demand for air services is expected to climb at a rapid rate, however, and employment should show a substantial increase. By 1975 the new supersonic transport should be operating at speeds up to 2,000 miles an hour over long distances. Subsonic jets with greatly increased capacity will be in use for either passengers or cargo -- able to be converted easily from one to the other as the need arises. A third type of plane now being developed is the vertical take-off and landing craft, with obvious benefits for passenger travel between urban centers.

Improvements are also anticipated in flight control and guidance, with extensive use of sophisticated electronic systems. All-weather landing equipment will increase both the safety and dependability of air travel, and continued improvements in passenger reservation control, cargo handling, and general maintenance will add to the speed and efficiency of ground operations.

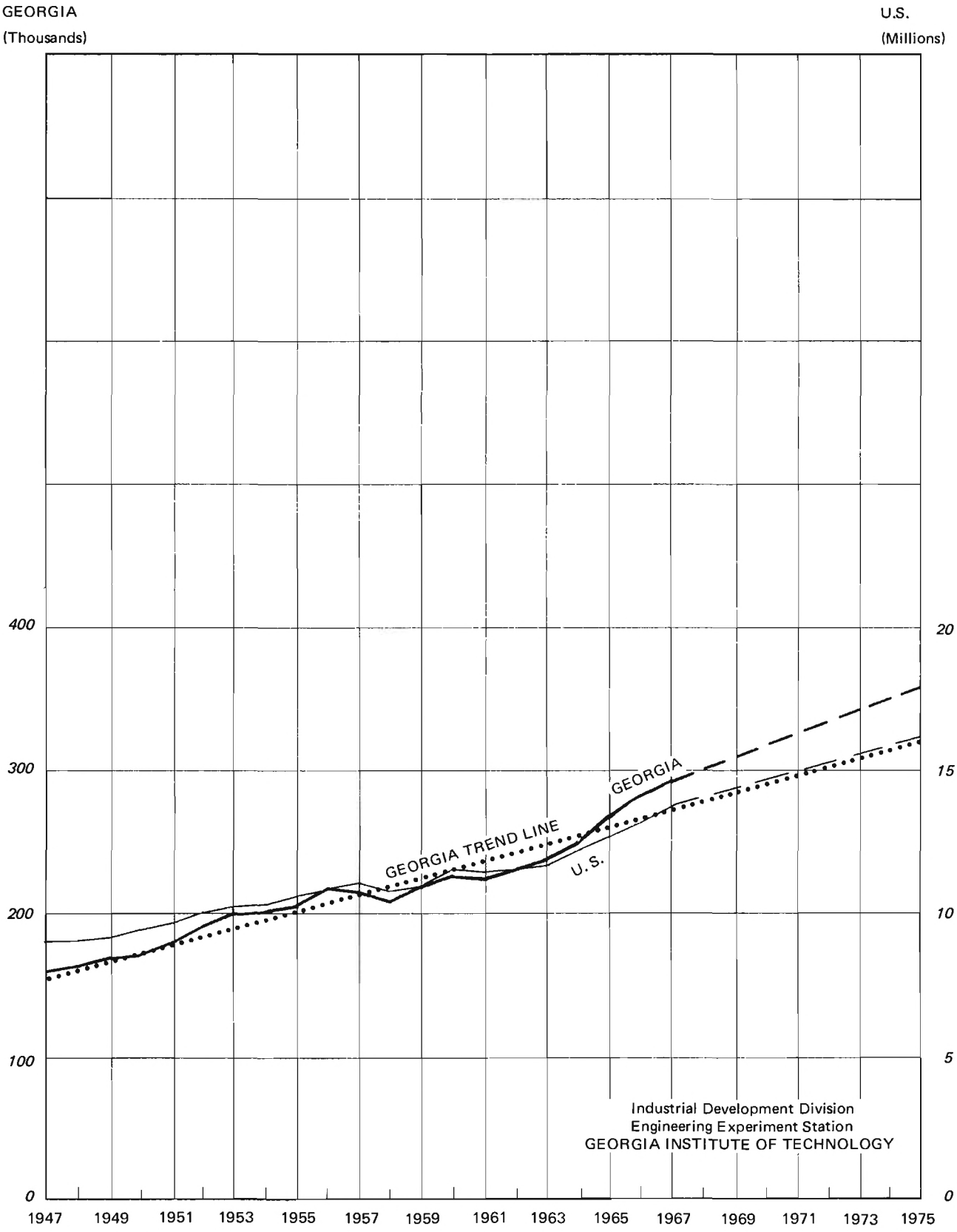
The demand for communications services is expected to rise rapidly, but employment is likely to remain fairly stable or show only moderate growth because of laborsaving technological innovations, particularly in telephone communications. Computers are already in widespread use for a multiplicity of jobs, displacing workers in many departments. Electronic switching equipment greatly reduces maintenance by checking itself and identifying the location and nature of any malfunction. Other improvements include microwave radio relay systems,

which have greater capacity than cable systems, and new methods of installation that simplify service changes. The number of operators continues to decline as long-distance dialing is extended, but decreases in these and other occupations will be offset by the demand for workers with different skills to handle the new equipment.

This same variation in occupations will occur in the electric, gas, and sanitary services, where technological advances will enable output to keep pace with demand with little growth in employment. In the electric power industry, larger, more efficient generating plants, the growing development of nuclear power, sophisticated electronic controls, and the increasing use of computers all will call for workers with more technical and professional skills. Similarly, in the gas industry, the use of computers, automatic controls, and improved storage and transmission systems are changing the occupational structure. One major laborsaving technique is now under intensive development -- the remote reading of meters from a central location. Since meter reading is at present one of the largest occupations in gas and electric utilities, this could lead to substantial reductions in employment.

As indicated at the beginning of this section, the net result of expansion of output combined with technological changes in this major industry division will be only a moderate increase in employment by 1975. In Georgia the 1947-1967 employment trend line indicates a 1975 employment figure of some 89,700 workers -- below the recent climb to 94,900 workers in 1967. Based on Georgia's gradually increasing proportion of U. S. employees, however, the state's employment in 1975 will be some 103,000 workers, representing 2.25% of the U. S. figure at that date, compared with 2.23% in 1967.

CHART 21
WHOLESALE AND RETAIL TRADE EMPLOYMENT



Source: See Introduction, page 1.

WHOLESALE AND RETAIL TRADE
(SIC Division F)

The increase in population and the growth of real income will combine to boost the volume of wholesale and retail trade. Employment also will increase rapidly, but at a somewhat lesser rate than overall sales, since various technological innovations will modify labor requirements in some occupations.

Improvements in materials-handling methods are increasing efficiency and decreasing labor requirements in wholesale centers and in large retail establishments. Computers are expected to be used more widely for accounting, billing, inventory control, and data processing -- not just by the major companies, but also by small businesses contracting out their work to computer service organizations.

The prepackaging of items by manufacturers and wholesalers in normal purchase quantities (rather than by the gross or dozen) is being extended, so that goods of all types arrive ready for retail display, thus saving the costs of breaking out and repackaging bulk shipments. Self-service is being introduced in more stores, and more items are expected to be sold through vending machines.

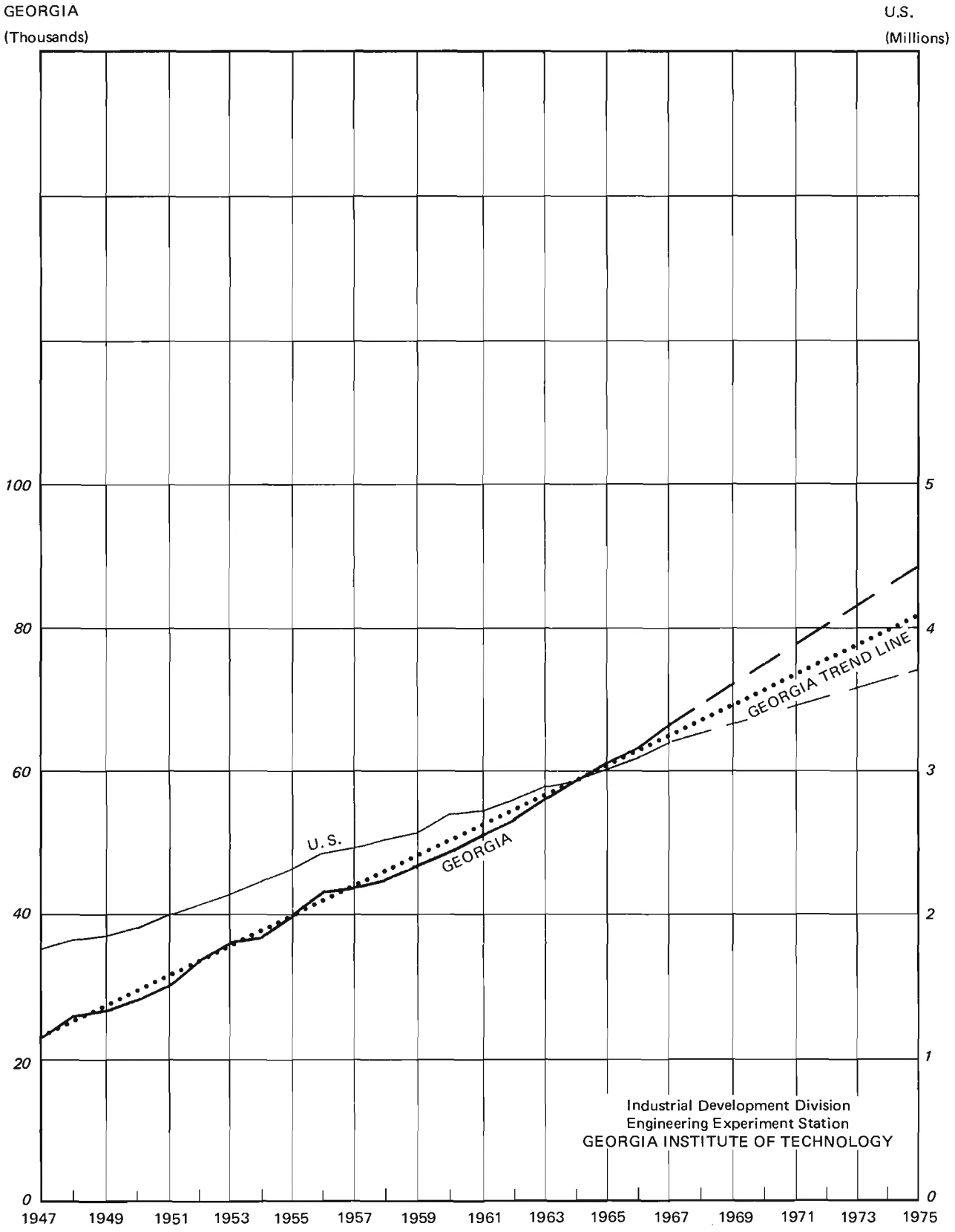
Some of these changes that are taking place will cause a shift in occupations rather than a decrease in employment. There will be a demand for computer programmers and technicians rather than bookkeepers, and men to service vending machines rather than store salesmen.

The trend to night opening of stores is expected to continue, and the number of part-time workers is likely to increase.

Georgia's employment in this industry has shown substantial growth, from 159,000 workers in 1947 to 290,000 in 1967. The state has also gained in relation to total U. S. employment -- from 1.78% in 1947 to 2.12% in 1967.

Projections on the basis of the 1947-1967 employment trend show some 317,100 employees for Georgia in wholesale and retail trade by 1975. The rapid rate of growth anticipated in this industry for the nation as a whole indicates a considerably higher figure for the state, however -- a 1975 total of 359,400 workers representing 2.23% of the U. S. employment.

CHART 22
FINANCE, INSURANCE, AND REAL ESTATE EMPLOYMENT



Source: See Introduction, page 1.

FINANCE, INSURANCE, AND REAL ESTATE
(SIC Division G)

Growth in this industry will continue to be stimulated by the increase in population, the rising levels of per capita income, and the general expansion of economic activity. Employment is expected to increase, but the rate of growth will be modified as the use of electronic equipment becomes more widespread.

Banks have introduced many new services over the past few years, and employment has risen substantially in spite of increasing automation in many banking operations. Most major banks have used computers for some years, and smaller banks are now either purchasing their own equipment or contracting for computer services. The processing of checks, loans, stock transfers, savings accounts, and many other banking functions can now be handled by electronic data processing equipment. This reduces clerical staff and at the same time allows the banks to expand their services. The new equipment, however, needs computer programmers, systems analysts, and other trained personnel, and the expanded services (including an increasing number of branch banks) necessitate more bank officials and supervisors.

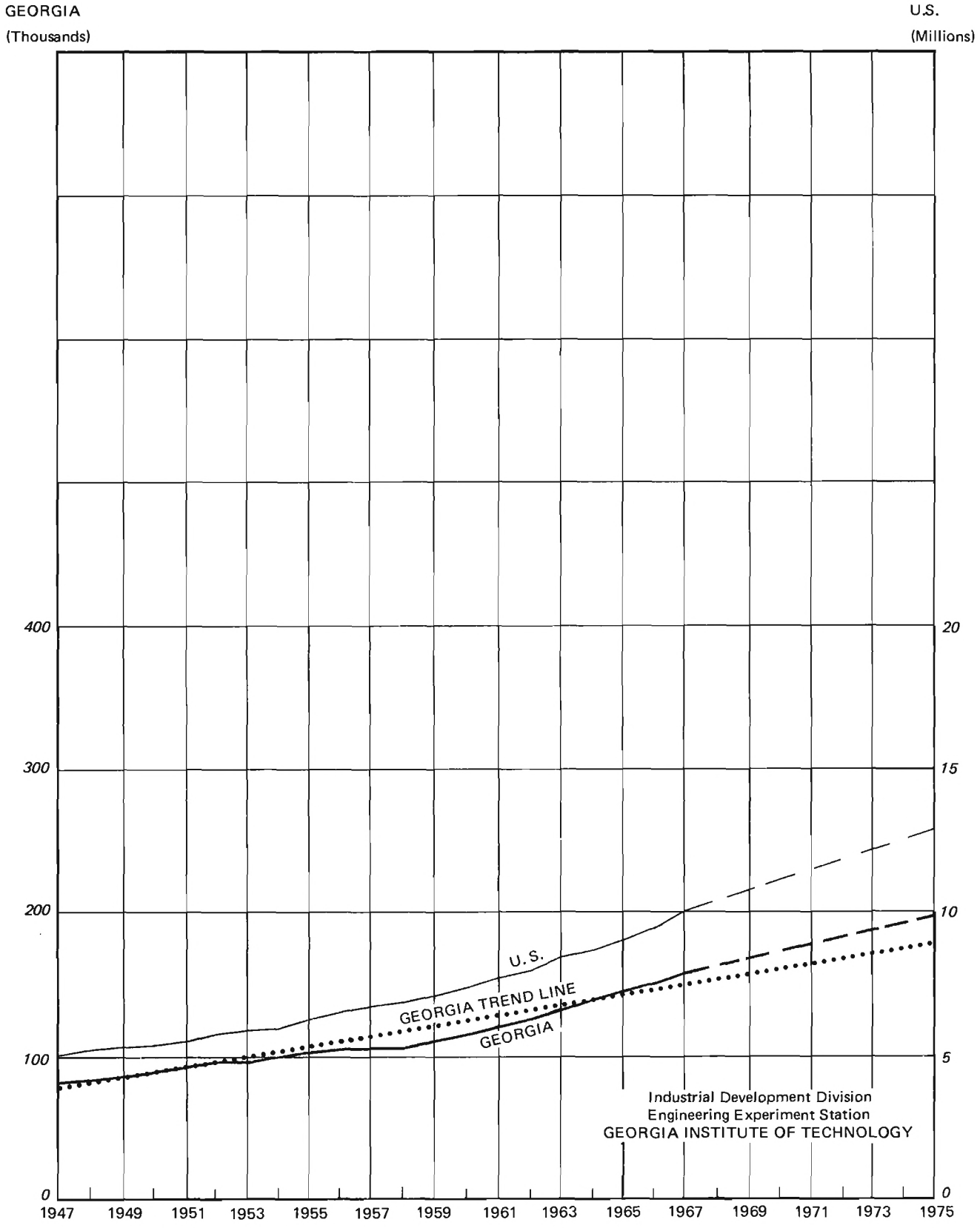
The net result is expected to be a continuing increase in the number of bank employees who will use electronic equipment to perform their work more rapidly and thus enable the banks to continue to expand their activities.

A similar situation obtains in the insurance business where computerization will reduce the need for clerical staff while handling an expanded volume of work. More personal service employees will be required, however, to maintain contact with the public, as well as the staff to operate and maintain the electronic equipment.

The real estate business is in a somewhat different position because the average firm is small and a high proportion of the work involves personal service. Although the use of electronic data processing equipment will reduce clerical workers in the relatively few large companies, the small firms are unlikely to be affected. Employment will continue to grow with increased demand for housing by newly formed families and the frequent buying and selling activity of the highly mobile population.

Employment in this industry division in Georgia climbed from 23,500 in 1947 to 66,200 in 1967. On the basis of the trend of the yearly figures for the state over this period, the projected employment in 1975 will reach 81,600 workers. Georgia's employment has been growing at a faster rate than that of the U. S., however, accounting for 2.05% of the nation in 1967 compared with 1.34% in 1947. The trend of this increasing proportion shows the state accounting for 2.36% of U. S. employment by 1975, equivalent to some 87,900 workers.

CHART 23
SERVICES EMPLOYMENT



Source: See Introduction, page 1.

SERVICES
(SIC Division H)

Employment in the services industries is expected to continue its rapid increase. The growth in population, the rise in per capita income, and the increase in leisure time will all contribute to the demand for services. In addition, the scope of the services offered continues to expand, and since most of the work is on a person-to-person basis, the impact of technological changes will be limited.

Medical and other health services (excluding government) will show a substantial increase and account for over 25% of the employees in this division in 1975. The extension of medical insurance and the increased proportion of old people in the population, combined with greater emphasis on preventive medicine, will stimulate the demand for all types of medical personnel. Medical research is expected to expand, and as new techniques and drugs are discovered, the range of treatments for the sick will become more extensive. The reduction of jobs resulting from the use of computers and such items as disposable equipment in hospitals and nursing homes will be more than offset by the tremendous demand for medical technologists, pharmacists, therapists, and all types of health workers.

Employment in private educational services also will increase rapidly as a result of the rise in school-age population and the increasing proportion of that age group who will attend high school or college. The use of instructional television and teaching machines is expected to become more widespread, but present experience indicates that they are aids rather than substitutes for teachers. Some reduction in clerical workers can be expected from the use of computers, but this will be outweighed by the demand for clerical help for teachers and for programmers for both the computers and the teaching machines.

Employment in hotels, motels, and other lodging places will continue to grow -- affected not only by the increasing population, but also by increased income and leisure time and the overall expansion of business activities. Vacation and business travel are both expected to increase, and the growing services offered for conferences, banquets, entertainment, and the like all mean larger staff requirements. Few of the machines in use by the industry can substitute for personal services, though dishwashers and other appliances may limit the growth in employment requirements in the kitchen.

Employment trends in miscellaneous business services -- advertising, direct mailing, stenographic services, employment agencies, janitorial services, etc. -- will vary among the individual industries, but the overall growth will be substantial. Since the firms performing these miscellaneous services are usually small, the amount of laborsaving equipment they will buy will be limited, especially as many of their functions are on a personal basis.

Automotive repair and services will expand with the increase in vehicles. Test equipment and power tools will reduce the time needed on repairs, but the greater output per worker will be offset to some degree by the increasing complexity of the average automobile.

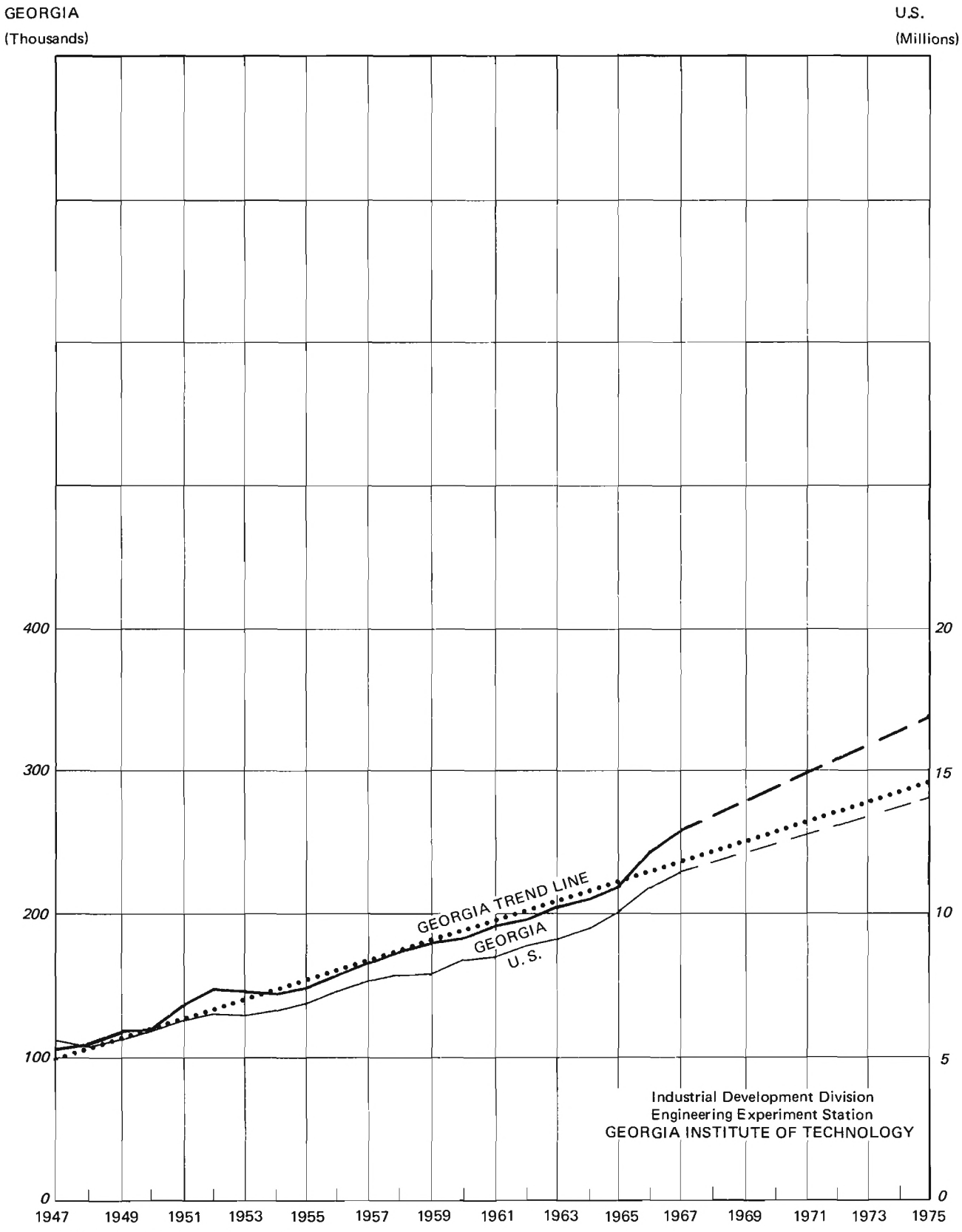
Other miscellaneous repair services will increase rapidly as the growing population acquires an even larger stock of durable goods that can break down in some way. Technological improvements in such items as radios, television receivers, tape recorders, and household appliances will help to reduce repair requirements; however, as the equipment becomes more complex, greater technical knowledge will be needed by the repairman. Repair shops are usually small, which tends to limit the use of laborsaving devices, but various types of testing equipment will be essential for many kinds of electronic repairs. Increased capital expenditure and the high cost of labor may eventually modify employment in some repair categories as replacement prices for some products become competitive with the cost of repair.

Employment changes in other service categories will be mixed, as new convenience items and automated equipment offset some of the service demands of the growing population. Coin-operated laundries and dry-cleaning units are in competition with laundry and dry cleaning establishments, and drip-dry and permanent press garments reduce the need for both personal and automated cleaning services; home permanents and home hair coloring kits take jobs from beauty parlors; and automatic elevators and pin-setting equipment eliminate the jobs of elevator operators and bowling pinboys.

In general, however, as indicated at the beginning of this section, employment in the service industries will grow substantially. Georgia in the past 20 years gained 73,900 employees in this industry, swelling from 82,500 in 1947 to 156,400 in 1967. If this growth trend is continued to 1975, the state will then have 175,700 workers in the services industry division. The rapid 1947-1967 increase, however, did not quite equal the growth rate in the nation as a

whole, and the ratio of Georgia's employment to that of the U. S. dropped slightly, from 1.63% in 1947 to 1.55% in 1967. On this basis, by 1975 Georgia's proportion of U. S. services employment will be 1.53%. The continued strong expansion anticipated for the U. S., however, will mean a much higher employment figure for Georgia even though its percentage of the national figure is reduced. A projection for the state on the basis of its relationship to the nation indicates a total of 198,100 workers in the services industry by 1975.

CHART 24
GOVERNMENT EMPLOYMENT



Source: See Introduction, page 1.

GOVERNMENT
(SIC Division I)

The rise in population will mean an increased demand for all types of government services, and employment is expected to increase substantially, particularly on state and local levels. Federal government employment is, of course, influenced by the new agencies and programs created by the administration and the pressures for cutbacks in projects that are being modified or phased out. In addition, the nation's military commitments can cause major fluctuations in the number of civilian employees in the Defense Department. If it is assumed that by 1975 conditions will have returned to a pre-Vietnam buildup status, then employees connected with defense are likely to be reduced.

Other departments are expected to show only moderate increases, with laborsaving technological developments enabling the employees to handle a much higher volume of work. Electronic data processing will be used more widely for a variety of routine jobs. Optical scanning equipment will eventually reduce the manual transcription of data to computers and will expand the capabilities of post office sorting machines. The use of this advanced equipment will cause a reduction in many clerical and sorting jobs, but at the same time will create a demand for programmers and highly skilled technicians.

Employment in state government is expected to grow rapidly to meet the needs of the increasing population. Existing services, particularly in education, will have to be expanded, and additional staff will be required for those federal programs which (if present policy is continued) are implemented by the states. The use of automatic data processing equipment will mean a demand for employees to maintain and operate it and some reduction in general clerical occupations.

A similar situation exists on the local government level, where an expansion of services will be needed for the increasing population. Electronic data processing will increase the demand for computer operating personnel, and the wider use of instructional television and automatic teaching devices in elementary and secondary schools will add to the need for professional and technical workers.

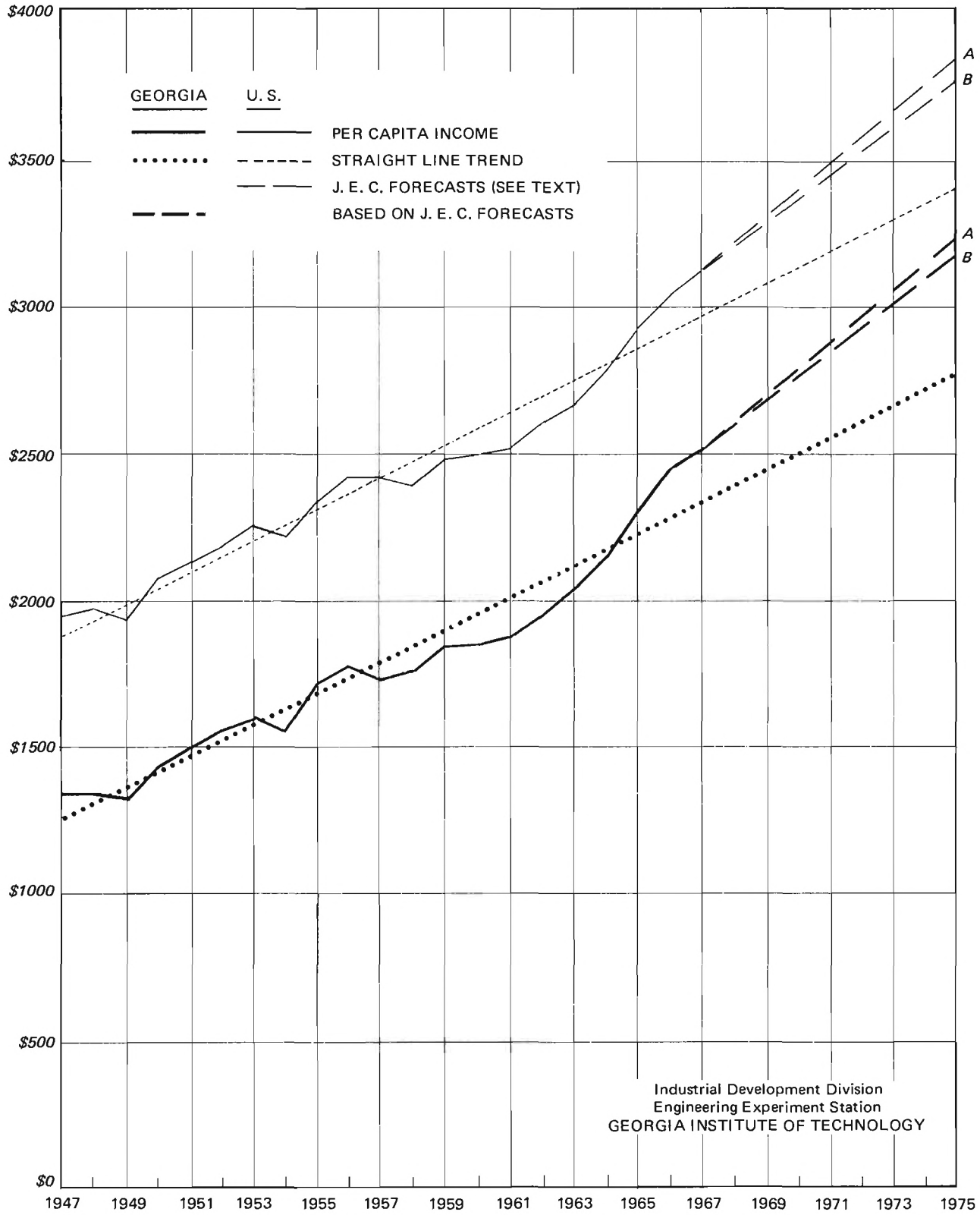
Government employment in Georgia climbed from 107,000 in 1947 to 258,900 in 1967, growing at a faster rate than the overall total for the U. S.

Projections to 1975 based on the 1947-1967 trend indicate some 292,400 government workers in the state by that date. Georgia's proportion of the national figures increased from 1.95% in 1947 to 2.23% in 1967, however; if this trend is continued, government employment in the state will reach nearly 336,700 -- some 2.38% of the anticipated U. S. total in 1975.

Appendix

A NOTE ON INCOME TRENDS

CHART 25
PER CAPITA INCOME, GEORGIA AND THE U. S.



Source: See Introduction, page 1.

GEORGIA'S ECONOMIC GROWTH AS MEASURED BY INCOME

Personal income is one of the most useful measures for gauging overall economic trends, since it includes all the income received by residents of an area from all sources. The data for Georgia[1/] over the past 20 years show an increase in total personal income from $2,890 million in 1947 to $11,330 million in 1967 -- a gain of 292%.

When these figures are adjusted to allow for the population change, the resultant per capita income for the state in 1967 is $2,513, an increase of 184% over the 1947 figure of $884. Part of this increase is due to inflation; the 1947 figure would be $1,321 in terms of 1967 dollars, yielding a gain between 1947 and 1967 of $1,192. On this modified basis, the 20-year increase in per capita income for Georgia is over 90%.

During this same period the average per capita income for the U. S. (in 1967 dollars) rose from $1,967 to $3,137, a gain of $1,170, or nearly 60%.

Georgia's percentage growth when compared with that of the U. S. looks encouraging -- as does the fact that by 1967 the state's per capita income had climbed to 80.1% of that of the nation in comparison to 67.2% in 1947. When the gap in actual dollars is calculated, however, Georgia was $646 below the U. S. per capita income figure in 1947 and $624 below in 1967. This gap has varied over the 20-year period from a low of $600 in 1966 to a high of $683 in 1957 (all in 1967 dollars), and the straight line (least squares) trends for the two series of income figures remain roughly parallel (see chart), with Georgia making only fractional gains each year in narrowing the gap.

If the two trend lines are carried forward to 1975, Georgia's per capita income is projected to $2,777, 81.6% of the U. S. figure of $3,403 (1967 dollars). A trend line based on Georgia's per capita income as a proportion of that of the U. S. gives a somewhat higher value of 84.1% ($2,862).

Projections of personal income made by the Staff of the Joint Economic Committee, however, show a higher rate of growth for the nation. The Committee's report anticipates not only increased total personal income because of

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1/ As estimated by the U. S. Department of Commerce, Office of Business Economics.

the growth of the labor force, but also increased productivity (as measured by output per man-hour) "as a result of the large-scale investments in human and physical resources -- business plant and equipment purchases, research and development, education, training, and so forth."[1/]

Calculations of per capita income based on the Committee's total personal income figures give two alternative forecasts for 1975: (A) $3,851 and (B) $3,775.[2/]

Accepting these per capita income figures for the U. S., the equivalent per capita income for Georgia, based on the proportionate trend, would be (A) $3,239 or (B) $3,175.

1/ "U. S. Economic Growth to 1975: Potentials and Problems." Study prepared for the Subcommittee on Economic Progress of the Joint Economic Committee, Congress of the United States, Washington, 1966.

2/ Based on (A) 4.5% and (B) 4.0% annual growth for real GNP.